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ON
FEMORAL RUPTURE.

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ON

FEMORAL RUPTURE;

ITS

ANATOMY, PATHOLOGY, AND SURGERY.

WITH A

NEW MODE OF OPERATING,

APPLICABLE TO

CASES OF STRANGULATED HERNIÆ GENERALLY.

WITH PLATES.

BY

JOHN GAY,

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PREFACE.

I have been led by the study of the anatomical relations of the parts concerned in the production of Femoral Rupture, to relieve the mass when strangulated by a new method of operating, which I believe to be more simple and safer than any which has hitherto been practised or described; the principle of which is capable of being applied to the relief not only of femoral, but to all outward forms of strangulated hernia.

In the following pages I have endeavoured to give, from their careful examination in above seventy subjects, a correct description of the parts concerned in femoral rupture, both before and after its formation. I have also given, as cursorily as was consistent with a sense of what is strictly due to their authors, the various modes of operating which have hitherto been practised for the relief of this affection; and by ascertaining the causes of death in a number of cases, have ventured to suggest some methods of treatment by which I conceive the present high rate of mortality consequent upon hernial operations generally may be lessened. It has not been my aim either to encumber the stores of minute anatomy with new fibres or fasciæ, or to enrich its nomenclature; but, in short, to gain from all available sources what is *true* and *essential to be known* in reference to the surgical anatomy and pathology of femoral rupture, with the genuine desire of rendering our knowledge of this disease accurate and comprehensive, and its treatment more simple and successful.

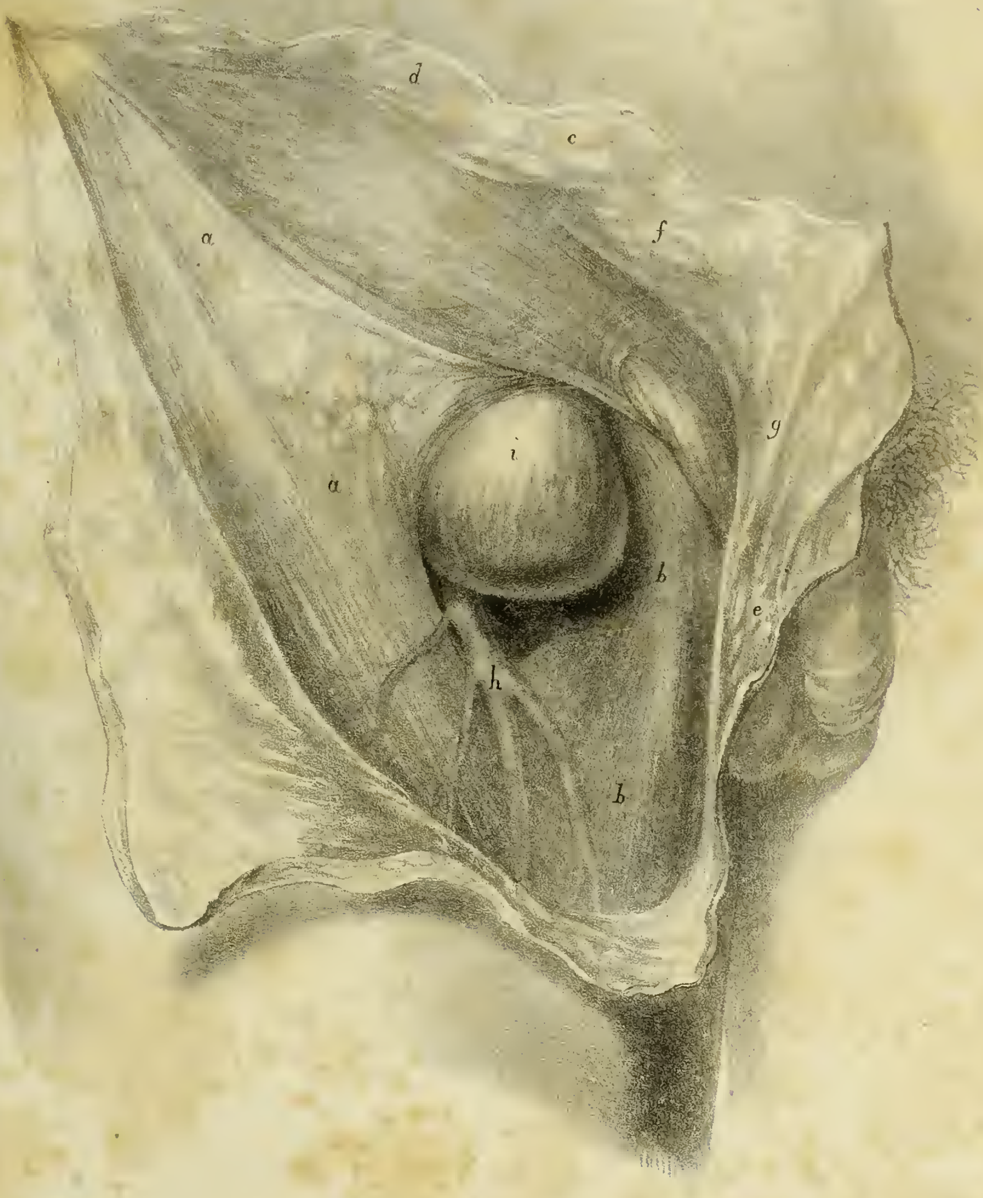
The principle of the new operation briefly consists in reaching the seat of stricture when external to the sac, by a small incision made through *healthy* structures, and in such a situation that the hernial mass shall not be injured or disturbed thereby.

For subjects in connection with femoral rupture, which have not been treated in detail in this work, the reader is referred amongst others to the works of Mr. Hey, Sir A. Cooper, especially the admirable edition by Mr. Key, Mr. Lawrence, and to the scattered but excellent Papers of Mr. Luke; to the writings, also well known, of Hesselbach, Scarpa, Langenbeck, Cloquet, and Breschet.

The Author has now the agreeable duty of gratefully acknowledging the kind services which he has received from those members of the profession, as well as others, to whom he has resorted for advice and assistance in the preparation of this work; especially to Mr. Key, Mr. Callaway, his esteemed friend and colleague Dr. T. B. Peacock, and to Mr. Erasmus Wilson. To the skill of this gentleman in the use of plaster of Paris and of the pencil, the Author is indebted for the correctness in detail of one of the lithographs by which this work is illustrated. The accuracy and artistic skill of Mr. Wm. Bagg in anatomical engravings are too well known and acknowledged to render an eulogium on the illustrations necessary.

J. G.

10, Finsbury Place, South,
September 26, 1848.



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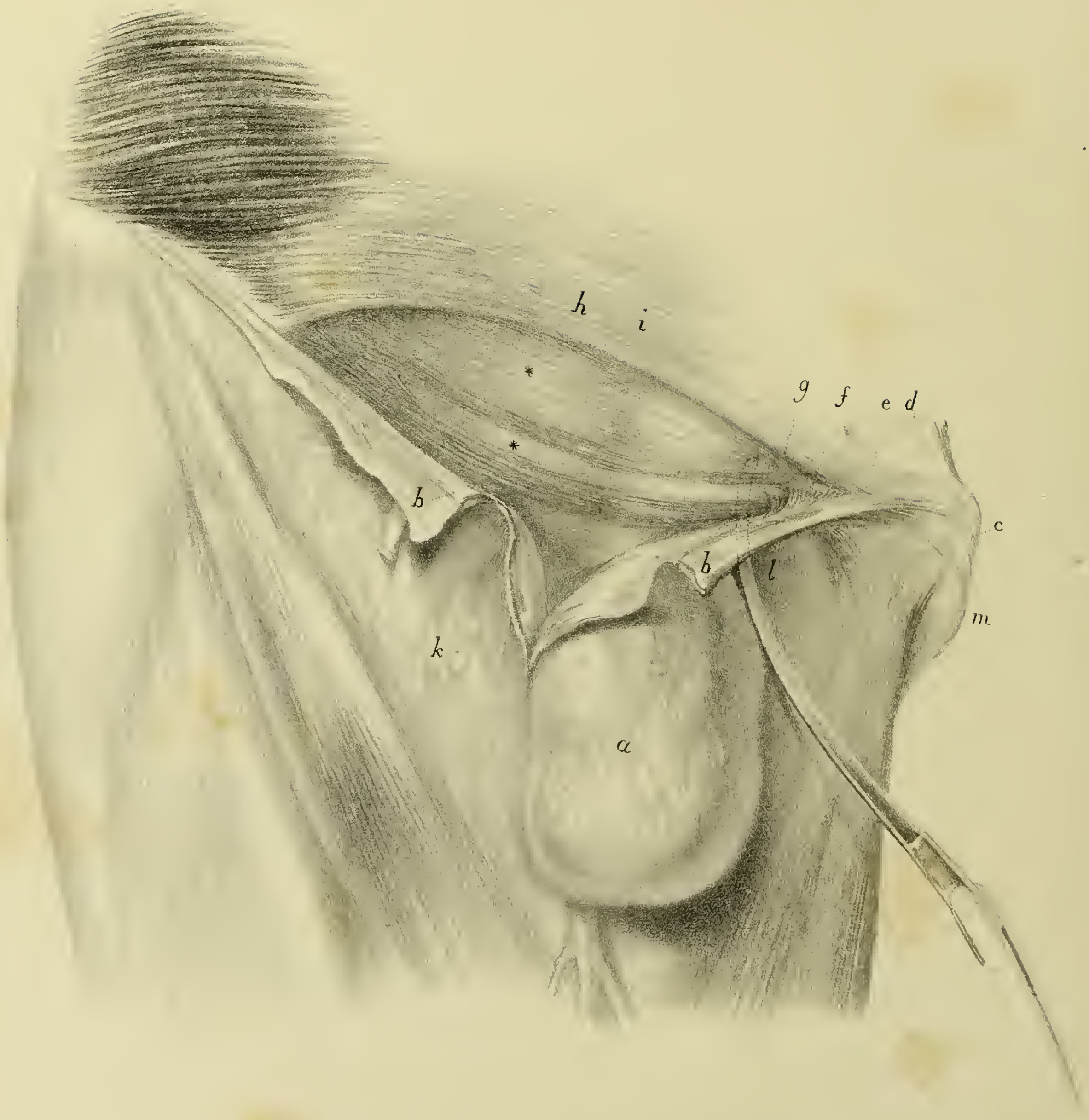

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PLATE I.

The hernial sac and parts, the subject of this drawing, were discovered in the course of a dissection. The tumour did not present those external indications that led to a suspicion of its existence, until the superficial and cribriform fasciæ had been cut through. The engraving was made from a cast and drawing of the parts taken by Mr. E. Wilson, and is well adapted to show the parts prior to their alterations by the processes of disease. The sac is denuded of its fascia propria. Any further description, but for the sake of junior students, would be superfluous.

a a.—Upper layer of the iliac portion of fascia lata.

b b.—Pubic portion of the same fascia, or *pectineal* fascia, forming the floor of the *femoral* fossa. Pl. ii. *l.*

c.—Falciform process, and portion of the border of the saphenous opening.

d.—External or semilunar portion of the same border.

e.—Burn's ligament, or pubic portion of the arch formed by the lower border of the same opening.

f.—Inferior pillar of the external abdominal ring; or that portion of the crural arch which terminates upon the tuberosity of the pubis and adjoining portion of the ileo-pectineal ridge.

g.—Spermatic cord.

h.—Saphenous vein.

i.—Hernial tumour.

A black line shows the situation and direction of the incision which is made through the integuments into the *femoral fossa*, for the new operation. See Plate iii. fig. 2, *e.*

PLATE II.

Represents a hernial tumour and the adjacent parts of the thigh, as they are displayed by the removal of the superficial fascia and the contents of the *femoral fossa.* The crural arch and upper layer of the iliac portion of the fascia lata have been divided and turned back, to show the deep layer of that fascia, and its relations to Hey's ligament. The knife is passed from the femoral fossa behind those seats of stricture, which are here seen.

a.—The hernial tumour with its cribriform covering.

b b.—The crural arch divided and turned back.

c.—Pubic insertion of the tendon of the external oblique muscle.

d.—Tendon of rectus.

e.—Pubic attachment of the conjoined tendons of the internal oblique and transversalis muscles.

f.—Portion of Gimbernat's ligament, formed by the outer pillar of the external abdominal ring.

g.—Portion of Gimbernat's ligament, formed by the falciform process of the fascia lata.

h.—Situation of the band of fibres belonging to the internal inguinal ligament of Hesselbach, below the *under layer* of the iliac fascia lata.

i.—The femoral, or Hey's ligament; or the *deep crural arch.*

k.—Upper lamina of the iliac portion of the fascia lata, divided vertically and thrown back, in order to display the *deep lamina,* with Hey's ligament, and its continuity to the arched margin of the internal oblique muscle.

l.—The femoral fossa.

m.—Process from the deep abdominal fascia which completes the upper arched border of the saphenous opening on the pubic side.

PLATE III. Fig. 1.

a.—The *front* wall of the femoral sheath, as displayed on the careful removal of the iliac fascia lata.

b, c.—Its iliac and pubic *walls.*

d, e, f.—The *angles* formed by the union of these walls.

g, h.—The *septa* by which the sheath is divided.

i.—The *upper orifice* of the crural canal, or *crural ring.*

k.—The venous compartment of the sheath.

l l.—Lines shewing the *direction* of the septa of the sheath,—the outer one being between the artery and vein.

m.—The front margin of the *lower* orifice of the sheath.

n.—The *crural canal.*

o.—Dotted line, showing the relative position of Hey's ligament to the front wall of the sheath.

p.—The band of fibres appertaining to the front wall of the sheath, described as the "fibræ crassiores" of the internal inguinal ligament of Hesselbach; also seen in Plate ii., *h.*

q.—Tendon of the rectus.

r.—The pubic margin of the *crural ring*: the septum crural had been pushed before a hernial sac, by which the canal had been occupied.

s.—The terminal portion of the saphenous vein.

Fig. 2.

Represents the front view of the thigh with a femoral rupture.

a.—Dotted outline of the situation of the crural arch.

b.—Dotted outline of the margins of the saphenous opening.

d.—Situation of the hernial tumour.

e.—The situation and direction of the first incision for the performance of the new operation.

Pl. 3.

Fig. 1.

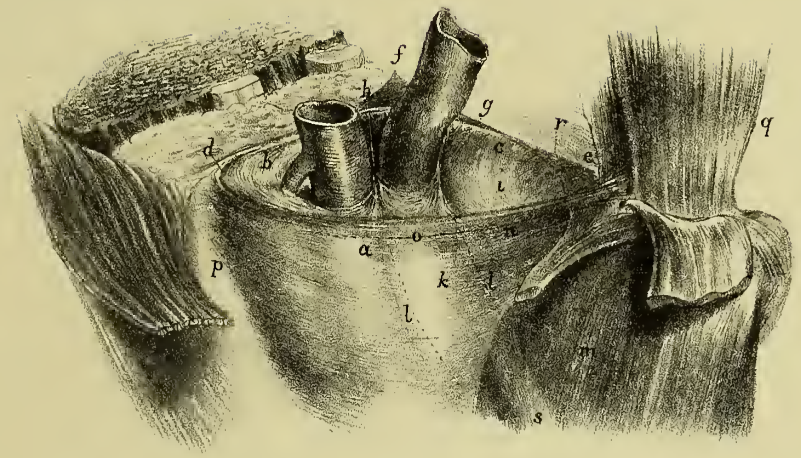
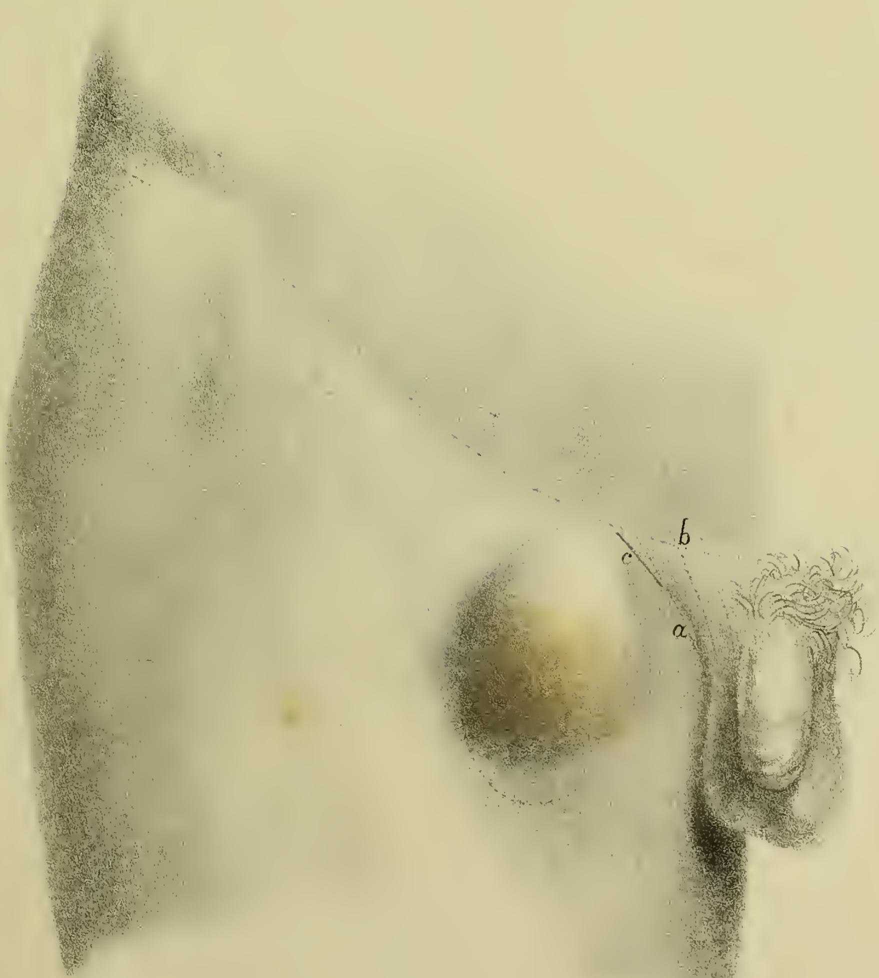


Fig. 2.



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ON

THE ANATOMY AND PATHOLOGY

OF THE PARTS CONCERNED IN

FEMORAL RUPTURE.

1—In entering upon the following details, I shall presume upon my reader's general acquaintance with the bony structures usually described in treatises on Femoral Rupture; and shall therefore only remind him of a few points, which must especially be borne in mind, in order to enable him to form a correct apprehension of the anatomical relations of the soft parts, as they will hereafter be presented.

2—The symphysis of the pubis being found, the finger directed outwards along the upper edge or crest of that bone for the distance of an inch, will discover a prominence, not so distinct in the subject as in the skeleton, called the tuberosity, or spinous process.* If a line, drawn across the front part of the thigh from this prominence to the summit of the great trochanter, be divided into thirds, the iliac third will lie over the neck of the thigh bone and the great trochanter; the middle third will horizontally bisect the head of the thigh bone; whilst the horizontal ramus of the os pubis and the parts immediately concerned in the anatomy of Femoral Rupture will be subjacent to the outer part of its pubic division.†

3—In directing attention to the osseous structures beneath the inner third of this supposed line, I shall first note the direction of the horizontal ramus of the pubis outwards and backwards, reaching at its extremity (the body being laid on its back) a point, an inch and an eighth below that of the tuberosity of the pubis, and about three quarters of an inch below that of the anterior superior spine of the ilium; and secondly, the hollow, or concavity, which the upper and front surface of the ramus, together with the tuberosity of the pubis, forms for the lodgment of the femoral vessels.

---

* Sir A. Cooper objected to its being called the *spinous process*, it has therefore usually been termed *the tuberosity*.

† By this simple process of measurement the sometimes difficult question, whether a given hernial tumour be inguinal or femoral, might be readily solved. For the same purpose M. Nivet directs: "Chercher avec le doigt indicateur l'épine du pubis, et remonter de la vers l'épine iliaque en suivant toujours le ligament de Fallope. Toute hernie située au-dessus du ligament sera inguinale, et au-dessous, crurale."—Malgaigne, p. 187.

At the tuberosity of the pubis, two ridges take a common origin, but immediately diverge from each other; the one, the ileo pectineal, following a course upwards, backwards, and outwards, over the rounded upper surface of the ramus, to gain the brim of the pelvis just above the ileo pectineal eminence; whilst the other, tends horizontally outwards to the edge of the acetabulum, and forms, by its outer half, the upper margin, or brow, of the obturator foramen. These ridges, very apparent in the skeleton, become less distinct in the subject, in consequence of a ligamentous expansion, with which this portion of the bone is covered.

4—From the relative positions of those parts of the skeleton which have just been referred to, it follows that Poupart's ligament, or (as in relation to femoral hernia it is better termed) *the crural arch,* in its course towards the anterior superior spine of the ilium, after leaving the body and tuberosity of the pubis, passes obliquely above, and some distance in front of, the ramus of that bone; and with it, assists in forming, in the part of the thigh under consideration, a triangular aperture, termed the *femoral* or *crural opening*, which looks downwards and outwards, and gives transit, amongst other structures, to the vessels and nerves which pass between the trunk and lower extremity.

5—This triangular opening, bounded in front by the inner, or pubic three-fifths of the crural arch, and behind, by the horizontal ramus of the pubis, is completed externally by a dense fibrous expansion, the *fascia iliaca,* which is stretched obliquely across between the ileo pectineal eminence and the crural arch, at the point of junction of the outer two, with the inner three fifths of that ligament, and serves to separate the contents of the femoral opening from the iliacus, and psoæ muscles.

6—The portion of that fascia which requires notice here, is attached above to the inner margin of the crest, and anterior superior spine of the ilium; in front, to the posterior edge of the crural arch along its outer two fifths, corresponding with the fleshy attachment of the transversalis muscle.* It then descends upon the iliacus and psoæ muscles and their tendons into the thigh, blending in front with the deep layer of the iliac fascia lata, which it meets at an acute angle; whilst behind, by uniting with a slip of the pectineal fascia, or pubic fascia lata, along its outer edge, it forms with it a kind of ligament, which attaches these fasciæ conjointly to the ileo pectineal eminence, and the capsule of the hip joint. The front surface of this fascia is covered by a thin extension of the fascia transversalis, with which it becomes almost inseparably united, (15 *e.*)*

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* On account of this connection with the crural arch, this fascia was considered by Gimbernat as a membranous expansion detached from its internal edge.

7—The capacity of the *femoral opening* is lessened by an expansion, partly fibrous and partly ligamentous, which occupies its pubic angle, and is usually known as *Gimbernat's ligament.*†

(*a*)—This *ligament* is thus formed:—The pubic extremity of the crural arch, detaches itself from the general aponeurosis of the external oblique muscle for several purposes, but chiefly that a fissure or *ring* (as it is called) be made for the passage of the spermatic cord or round ligament, of which this detached portion forms the *outer* or *inferior pillar.* To the point where this separation takes place, the crural arch, or Poupart's ligament, is merely the lower thickened margin of the aponeurosis of the external oblique, rounded in front and below, but bevelled off into a thin edge behind, by which it is attached to the deep layer of the iliac fascia lata (12 *g*); beyond that point this ligament, partly by an addition to, and partly by a flattening out of, its own fibres, resolves itself into a *firm triangular expansion,*‡ which stretches across the pubic angle of the femoral opening to be implanted into the tuberosity of the pubis and adjoining portion of the ileo pectineal crest, for a distance varying in extent; sometimes it has been observed to be prolonged outwardly, becoming gradually narrower and less dense, until by its extreme point it reaches, and is almost insensibly lost in the tissue which coats the ileo pectineal eminence.

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* By most anatomists the fascia transversalis is considered to *unite* with the outer edge of the fascia iliaca, behind the crural arch, as though the two were but distinct portions of the same membranous expansion. I have been led, from repeated and careful examinations, to regard them differently.—(See note to sec. 15 *e.*)

† Sir A. Cooper calls this ligamentous expansion of the inferior column of the ring, the *third insertion of the tendon of the external oblique;* the first being into the symphysis, and the second into the tuberosity of the pubis.

‡ Garengeot has well described this ligament; but it was Gimbernat who first observed its relations to Femoral Rupture, which he described as follows:—"When the inferior pillar separates from the superior to form the inguinal ring, it goes to insert itself into a tubercle of the pubis, termed its spine, which gives rise to the crest of superior ramus of the bone, and is a continuation of the ileo pectineal line; but this pillar is not only attached to the spine by a *considerable union of aponeurotic fibres;* but the duplicature of the arch (the posterior thin edge of Poupart's ligament) being much greater there, it is continued inwards, attaching itself to the crest of the pubis by means of a remarkable fold, which is formed from a portion of this aponeurosis. The particulars of this fold or duplicature, directed from below upwards, and its attachment, which is extended *from the spine to the end of the crest,* is so admirable, that it deserves attentive consideration; for without it, all would perhaps suffer large and dangerous protrusions of intestine."—(Nuevo Modo de Opera en la Hernia Crural, de Gimbernat, Madrid, 1793.)

(*b*)—The addition to this ligamentous structure is made in a manner hereafter more particularly to be described, by some fibres of the falciform process of the iliac fascia lata, which are continued directly backwards to a portion of the ileo pectineal crest, external to that which receives the outermost fibres of the expansion just alluded to (12 *c*).* The fibres of these constituent portions of Gimbernat's ligament, commingle; but still, its outer free edge—that which bounds the femoral opening on the pubic side—is principally provided by the fascia lata, and can, to a certain degree, be tightened or relaxed by any muscular action which is capable of producing these effects upon that structure generally. †

(*c*)—The *abdominal* surface of this horizontally-disposed ligament is covered loosely by a portion of the fascia transversalis,‡ and by the terminal fibres of a small ligamentous band (15 *g*), which traverse it in order to reach the edge of the rectus tendon; also by a few of the fibres of Hey's ligament (12 *f*), which cross it obliquely, in order to gain the edge of the conjoined tendons of the internal oblique and transversalis muscles. A process of the fascia lata is applied against the front portion of its *femoral surface*, whilst that against the bone is inseparably united to the opposite surface of the *pectineal* fascia, or *pubic* fascia lata, (12 *k*.) The pubic wall of the orifice of the absorbent compartment of the femoral sheath, or of the *femoral ring*, (16 *c*), as it is termed, lies against, and is attached by delicate fibres to its lunated outer edge, supported by the section of Hey's ligament, which skirts that edge along the anterior half of its course. The general dimensions of this ligament, in conformity with the relative capacity of the femoral opening, are usually greater in women than in men.*

---

* I think with Mr. Guthrie that the part which the fascia lata has in forming the "anterior (external) part of this ligament" is "not sufficiently appreciated;" but I cannot so far estimate it, as to admit with that gentleman that this process "causes the greatest compression in the hernia, and is the seat of external stricture."—(On some points connected with the Anatomy and Surgery of Inguinal and Femoral Rupture, by G. J. Guthrie, 4to, London, 1833.)

† For further account of this structure see sec. 12 *c*.

‡ The portion of the fascia transversalis in which these fibres are found, as it sweeps over the edge and upper surface of Gimbernat's ligament to gain the ramus of the pubis and edge of the tendon of the rectus, has been regarded by M. Cloquet and others as one of *two* laminæ, of which they make that ligament to consist. (See Cloquet's Anatomical Description of Herniæ, by M'Whinnie, page 30.) Dr. Manec says correctly of the fascia transversalis that it is united "par la face inférieure avec l'expansion aponeurotique qui nous avons appellé pilier postérieure;" (the portion of Gimbernat's ligament supplied by the fascia lata;) but there appears to be no reason why it should follow that "Ces deux lames réunies constituent véritablement ce que l'on a appellé ligament de Gimbernat."—Récherches sur la Hernie Crurale, par Dr. Manec. Paris, 1826, p. 24. (See sec. 15 *g*, and notes.)

(*d*)—The lunated edge of Gimbernat's ligament has been constantly observed to be stretched by the outward pressure of a hernial tumour; but as in relation to it, Hey's ligament is situated concentrically nearer the axis of the femoral ring, so the latter will have first to sustain that pressure; but in case of its yielding, the pressure will be borne by Hey's and the edge of Gimbernat's ligaments conjointly.†

8—The tendinous insertions of several muscles, wholly or partially attached to the body of the os pubis and adjoining portion of its horizontal ramus, require description here; whilst an anatomical account of the muscles themselves would be irrelevant to the purpose of the present sketch.

(*a*)—The broad and flat tendon of the rectus abdominis is inserted into the fore part of the body and symphysis of the os pubis, a little below its crest. It is separated from the peritoneum behind by a little cellular tissue, and also in most subjects by a well-defined process from the fascia transversalis, which detaches itself at the edge of the tendon, and passes onwards to the mesial line, where it unites with a corresponding prolongation from the opposite side.‡ The outer edge of this tendon is thin, and gives attachment to, or rather merges into, the inner edge of the fascia transversalis, the fibres of which are here distinctly aponeurotic, arranged parallel to the edge of the tendon, and become more dense as they approach it. At the extreme point of its external attachment to the bone, the pubic terminal portion of a delicate fasciculus of fibres, imbedded in, and forming part of, the tissue of the fascia transversalis, will be seen implanted, partly into the edge of the tendon, and partly into the bone; whilst occasionally a few of the fibres pass behind the tendon, with that lamina from the fascia transversalis which has just been described.

---

* This was first noticed by Dr. Monro, and has been verified by subsequent observations.—(See a paper by Mr. Allan Burns, in Edinburgh Med. Journal, 1806, p. 267.)

† Mr. A. Burns states, "That in all those cases in which he and Dr. Monro had an opportunity of examining crural hernia, this septum or duplicature has invariably been found to measure at least one third more from its point of junction with the crural ligament to its insertion into the lineo-ileo-pectinea than, in a healthy condition, it ought to have done."—(Paper cit., p. 267.)

‡ I cannot reconcile the description of the "ligament sus-pubien" given by M. Breschet, which had not been described or figured before, (see Memoir cit., pp. 125, 126,) with any but this structure. According to that anatomist, "Sa face postérieure correspond au péritoine, et lui est adhérente par du tissu lamineux assez lâche; sa face antérieure est appliquée sur l'extrémité inférieure des muscles sterno-pubiens, et s'en trouve separée de manière à permettre l'introduction de l'extrémité du manche d'un scalpel entre cette production fibreuse et la face postérieure des muscles sterno-pubiens. * * * Les usages de ce corps fibreux sont peut-être de favoriser la tension de la ligne blanche et du ligament de Gimbernat."

(*b*)—The portions of the internal oblique and transversalis muscles to which I shall allude, arise, the former, from the iliac two-thirds, the latter, from the iliac half, of the upper edge of the crural arch; their fibres take a curved direction towards the linea alba, and terminate opposite the outer edge of the tendon of the rectus in a flat and strong tendon, which crosses its front surface, and descends obliquely inwards to be inserted below it, into the front part of the body and ramus of the os pubis. The superior fibres of this tendon gain the front of the body of that bone; whilst the inferior bend slightly backwards to gain its tuberosity and the first portion of the ileo-pectineal ridge, immediately above the insertion of that portion of Gimbernat's ligament which is contributed by the crural arch.* In front, the conjoined tendon is covered by a lamina from the deep layer of the iliac fascia lata, a portion of the pyramidalis muscle, the pillars of the external abdominal ring, and the cord or round ligament as it passes between them.

(*c*)—Some fibres from the pubic termination of Hey's ligament are attached to the outer edge of this tendon at its point of connection with the bone, as well as to the bone itself (12 *f*).

(*d*)—These tendons, with the aid of their fascial and ligamentous connections, *when in a tense condition*, present very considerable obstacles either to direct or oblique inguinal protrusions; but they certainly favour the direction of any of the contents of the abdomen, when impelled against its lower and lateral boundary, towards the ordinary outlet for Femoral Rupture; and this circumstance, together with the fact of the greater relative capacity of the femoral opening in women, appears to me satisfactorily to account for their being so frequently the subjects of this form of rupture.

9—If the integuments be now carefully reflected from the lower part of the abdomen, and upper part of the thigh, the *superficial fascia* will be exposed, continuous over the crural arch, with that which invests the abdominal parietes generally.

(*a*)—This fascia varies much in different subjects, whence the very different anatomical accounts which are given of it; but in general, it will be found to consist of two or more distinct layers, which enclose between them the superficial vessels, nerves, and glands of the upper part of the thigh. When but one layer can be distinguished, it is usually dense; and the glands and vessels appertaining to it will be found imbedded in its tissue, so that they can only be separated together with it from the adjoining textures both above and below: whence it may be inferred that originally it consisted of two or more laminæ, which have become consolidated.

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* The meeting of these fibres, and their decussation on the ileo-pectineal ridge, appear to have led Breschet to consider Gimbernat's ligament in the light of a continuation of the fibres of the transversalis tendon, augmented in front by those of the fascia lata.—(See Considérations Anatomiques.)

(*b*)—The external layer of this fascia is spread uniformly over the front of the thigh; and for a considerable distance below the femoral arch is manifestly fibrous, owing to the admixture with its tissue of strong fibro-cellular, and occasionally even muscular, fibres, which traverse the thigh in a direction nearly parallel to that of the crural arch. These fibres are more distinct and firmer towards the arch, and become gradually extinct in the opposite direction.

(*c*)—The under, or deep layer, constituted of irregularly-shaped laminæ, lies upon the fascia lata and the contents of the saphenous opening; and to these parts it is connected not only by the nervous and vascular filaments which pass between them, but also by intervening fibro-cellular bands. These vary in density and breadth, being generally most powerfully developed in the neighbourhood of the external margin of the saphenous opening, and may be regarded as belonging equally to either of the surfaces which they connect, inasmuch as from either there is about the same amount of difficulty in detaching them. Through the saphenous opening this layer sends down prolongations into the fossa (femoral), beneath, which invest the glands and vessels by which it is partly occupied, and serve to secure and support them in their respective situations.

(*d*)—At the inner edge of the thigh the united layers become closely applied upon the fascia lata, as it covers the tendon of the long head of the triceps muscle; whilst a distinct prolongation stretches itself over the cord or round ligament, to be continuous with the superficial fascia of the pubic region.

(*e*)—Incorporated with, or situated between, the laminæ of this fascia, is a chain of glands which usually overlies the crural arch immediately above the falciform process of the fascia lata; whilst another series generally skirts the outer edge of the saphenous opening, and a third occupies the opening itself and the fossa within, often extending along on either side of, and in close adherence to, the terminal portion of the saphenous vein.

The efferent lymphatics from these several clusters of glands pass through the saphenous opening, and enter the compartment of the sheath of the femoral vessels through an aperture in its pubic wall. The veins usually small and of little consequence, correspond in names and courses with the arteries which they severally accompany; the arteries being principally the superficial epigastric and small branches which belong to the skin on the front of the thigh and pubes. The nerves are,—branches from the anterior crural,—one of which penetrates the fascia lata just below the crural arch, about midway across the thigh,—from the genito-crural nerves, and lumbar plexus.

(*f*)—The varieties which obtain in the structure and physical qualities of this fascia depend much upon the amount of adipose tissue which its meshes contain; and hence whereas in a thin subject it might form a definite and tense layer, which even in the course of an operation might be readily recognized, in another, abounding with fat, its individuality might be lost through its absorption into the tegumentary adipose layer.*

(*g*)—The alterations in this fascia, in consequence of hernial protrusions, do not demand for them any consideration beyond the mere statement that it is liable to become thickened, and to adhere firmly to the subjacent covering of the hernia; and that on every side of the invading tumour it is raised above its natural level, according to the size of the tumour, and the position it assumes. Its glands are, however, likely to become enlarged, to suppurate, or to be converted into cysts, either singly or in clusters; and should a gland, or a chain of glands, thus affected, (or even not at all diseased,) lie in advance of a protruding rupture, and be pushed before it, it might not only give a false colouring to the character of the tumour, but also greatly embarrass the surgeon in case he should be required to operate upon it.†

(10)—Reflect the fascia superficialis with its vessels, nerves, and ganglia; and the following parts will present themselves for examination.‡ The margin of the saphenous opening, more or less of which will be seen according to the size and position of the hernial mass; the iliac fascia lata; the fascia cribriformis, covering the hernial tumour; also a space or hollow on the inner side of the thigh, being a portion of that occupied by the hernial mass, between the pubic wall of the femoral sheath and the inner edge of the thigh, which I shall take the liberty of calling the *Femoral Fossa* (22), and the saphenous vein.

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* Sir A. Cooper states that this layer, under certain circumstances, acquires considerable density; and Mr. Liston says that then alone "is it deserving the name of fascia."

† Ritcher says that an inflamed ganglion in the situation of a Femoral Rupture is very like an omental Femoral Rupture; and not only so, but that the co-existence of these two affections is by no means a rare occurrence.—("Traité des Hernies," par A. G. Richter, trad. de Rougemont, 1803.)

Mr. Else found a crural hernia behind a suppurating lymphatic gland.—(Lond. Med. Obs., vol. iv., p. 345.)

Sir A. Cooper has described a case in which a steatomatous tumour developed in this fascia had all the appearances of a femoral hernia.

"Le *fascia superficialis*, le fascia perforata, et la gaîne celluleuse des vaisseaux, peuvent, dans quelques circonstances, favoriser la formation de kystes, ou de tumeurs enkystées, de figures variées, situées sur la face antérieure de la hernie, et dont la présence inquiète et embarrasse parfois considérablement l'opérateur. Nous pouvons citer *plusieurs* observations curieuses qui viennent à l'appui de ce que nous avançons."—(Considerations et Observations Anatomiques et Pathologiques sur la Hernie Femorale. Par Gilbert Breschet. 1819, Paris.)

Mr. Howship records a case as having occurred in his practice in which a cluster of glands completely obscured a small hernial protrusion.

‡ The separation of the fascia superficialis should be most cautiously effected, in order to render the definition of the saphenous opening very clear, on account of its close adherence to the borders of that aperture. In order to do this, the saphenous vein should be first found, and the clearing of the fasciæ and other tissues which obscure the margin should be made from the point of the margin immediately beneath the vein.

(11)—At the inner and front part of the thigh, and *immediately beneath the crural arch*, is an incomplete ovoid aperture of considerable dimensions,* *apparently* an aperture in the fascia lata, but *really* formed by the folding back of the upper layer of that fascia upon itself, in such a manner, that the margin of this,—*the saphenous opening*,—is furnished by the curved line of its reflection.

(*a*)—This margin might be considered, for the sake of more clearly describing its relations to femoral rupture, as consisting of two arches, *a superior and an inferior*, which confront each other; and an external crescentic, or semi-lunar portion, which unites their outer or iliac pillars.

(*b*)—The margin thus formed should be traced from that point beneath the crural arch, where the fascia lata unites its fibres with those of the inferior column of the external abdominal ring, in order to complete the ligament of Gimbernat, which is distant about an inch and a half directly outwards from the spine of the pubis; whence it is continued, describing in its course a curve, with its concavity directed towards the inner edge of the thigh, to the point where it is lost beneath the saphenous vein. This is the lowest point to which the inferior arch dips, and completes the outer or iliac portion of the saphenous border and halves of its two arches. The first portion, or the outer half of the upper arch, is termed "the falciform," whilst the next has been called the "external" or "semilunar" edge.

(*c*) The terminal or inner half of the lower arch, usually, but with much impropriety, termed Burn's *ligament*, after re-appearing on the pubic side of the vein, is continued inwards and upwards for a short distance towards the tuberosity of the pubis, and is lost at that point where it overtakes the sloping surface of the pectineus muscle, by unfolding its double layer in order therewith to form the single layer of pubic fascia lata or *pectineal* fascia, as I shall hereafter term it, with which that muscle is covered.

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* Cloquet's account of the dimensions of this aperture is as follows, and, as far as I have observed, correct:—"This aperture is nearer to the crural arch in the female than in the male; its great diameter, which is vertical, is from six to ten lines in length; its small diameter is transverse, and measures about eight lines." The remaining part, as to its distance from the crural arch, does not accord with my observation. "Its upper extremity not very clearly defined in some subjects is separated from the crural arch by an interval of only three or four lines; in others the distance amounts to an inch and a half."—(Anatomical Description of the Parts concerned in Inguinal and Femoral Hernia, by Jules Cloquet, translated by A. M'Whinnie, London, 1835, page 33.)

(*d*)—The inner half of the upper arch is formed by the lower edge of a distinct process from the deep abdominal or Scarpa's fascia. It disengages itself on the outer side of the external abdominal ring, crosses the crural arch so that its lower edge bisects it obliquely, at the point where the falciform process of the iliac fascia lata escapes beneath it, passes over the upper and inner corner of the femoral fossa immediately below and parallel with the cord or round ligament, and is lost on the *pectineal* fascia below the tuberosity of the pubis. This narrow process of fascia lies on a plane, slightly above that of the other portions of the saphenous margin, and by its wiry and tense edge becomes a sure guide in all operative proceedings in its vicinity, especially in that which is hereafter to be described. Occasionally the edge is not so distinct to the dissector, on account of its union with some one, more dense, than the rest, of the laminæ of which the deep layer of the superficial fascia is composed (pl. 3, fig. 2 *a*).

(*e*)—The defect in the ovoid figure of this opening, which the margins, if completed, would make, arises from the want of a segment on the pubic side; and is due to the obliquity of the surface of the pectineus muscle, which is so great that the portion on which the required segment would rest obtains an elevation considerably above the plane of its existing components.

(*f*)—The whole of the *iliac* portion of the saphenous margin lies upon the sheath of the femoral vessels, bordering closely upon the front edge of the aperture which transmits the vein and absorbents, and is attached to it by delicate filamentous tissue;* whilst the *pubic* portions have no connection with the sheath, but, on the other hand, are separated from it by a considerable space. Hence the saphenous opening is in reality the entrance to the femoral fossa only, and cannot be looked upon as the lower orifice of the femoral canal (16 *a*), as books usually instruct us. A hernial tumour is said to have *completely* descended, immediately on its having advanced beyond the boundaries of the sheath, before even it reaches, and although it might never protrude beyond, the borders of the saphenous opening; hence the aperture in the sheath is the real orifice of the *femoral canal* in the thigh.

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* To this connection between the outer margin of the saphenous opening and the sheath of the vessels, Mr. Morton ascribes the occasional tilting of the fundus of a hernial tumour forwards and upwards.—(Surgical Anatomy of the Groin, by Thos. Morton, 1839, page 110.)

(*g*)—The edge of the fascia cribriformis is attached to the under layer of the fascia lata, just within the iliac margins of this opening, whilst the saphenous vein and its sheath (pl. 1, *h*) pass over the lowest point of the inferior arch, bound down by a prolongation of the cribriform fascia.

(*h*)—The constituents of the ring (16 *c*) through which a hernial tumour ordinarily makes its escape from the abdominal cavity, are so placed in relation to this opening, and the canal which intervenes, that the fore part of the tumour is directed especially against its falciform edge, or outer half of its upper arch;* and, unless very large, altogether escapes contact with the edge of that process of fascia which I have described as completing its upper arch towards the pubis (11 *d*).

(*i*)—The effect of a hernial protrusion upon the portions of the saphenous margin with which it comes into contact, is the effusion of lymph, by which their respective tissues become thickened and agglutinated together; but these changes are generally confined to the falciform and upper part of its semilunar margins. When large hernial masses have been allowed to hang without support for a considerable period of time, the adhesions between the saphenous edge and the adjoining hernial covering, will be found to be strengthened by a series of suspensory fibrous bands, which add considerably to the general density of the tissues which cover the front portion of the neck of a hernial sac.

(12)—A strong and rather dense fascia immediately invests the muscles of the thigh, and sends down prolongations which separate, and form sheaths for, the deeper muscular masses. If traced upwards, it will be found to be continuous with the deep abdominal layer, known as Scarpa's fascia; but this fact is of comparatively little import, for with the lower edge of the crural arch the outer portion of this—the *fascia lata*†—forms connections, hereafter to be noticed, which are sufficient to counteract any tractile influence which the one might otherwise have exercised over the other. It is, however, under the control of the tensor vaginæ femoris muscle, which is ensheathed between its laminæ, terminating upon them just below the great trochanter.

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* See the relations of a hernial tumour, as represented in plate 1.

† The fascia lata was known to Gimbernat, especially in its more important relations to the crural arch, but was not distinguished by him from the more delicate laminæ beneath. He observed, that the arch "is kept sufficiently tense by an expansion of it that unites intimately with the arch in its whole length in such a manner, that if the expansion be cut, the arch is considerably relaxed." Hence the practical inference, that in attempting to return a hernial tumour, the thigh should be bent, and the whole limb rotated inwards. Dr. Monro (secundus) sums up his account of this fascia in nearly the same words. "It is strongly connected to the crural arch, for the fibres of both aponeuroses seem to be interwoven. This intimate union of parts keeps the crural arch tight, for upon bending the thigh or cutting the fascia of the thigh, the

(*a*)—It is usual and convenient to study this fascia as though it consisted of two portions, the *iliac* (pl. 1, *a a*) and the *pubic* (pl. 1, *b b*); the one covering the muscles on the outer, the other those on the inner, side of the thigh.

(*b*)—The *iliac* portion of this fascia is easily demonstrated, as it extends from the crest of the ilium and the outer edge of the thigh inwards as far as the whole of the outer or iliac border of the saphenous opening, which, in accordance with what has already been stated, is formed by it (11). Above, it is attached to the lower or rounded edge of the crural arch, from the anterior superior spine of the ilium to the point of its forming the inferior column of the external abdominal ring, by means, partly of an intervening layer of fibro cellular tissue, and partly of short aponeurotic fibres, which take an oblique course from the edge of the fascia, upwards and inwards, to incorporate themselves with the tissue of which the crural arch is constituted.

(*c*)—The portion of the iliac fascia lata next adjoining the crural arch, as it tends towards the inner edge of the thigh, from being encroached upon by the upper and outer portion of the saphenous opening, becomes gradually reduced in width, and at the same time assumes a more distinctly fibrous character. This—" its *falciform*"—process does not however terminate abruptly as it appears to do; but takes a curved direction, obliquely inwards and backwards, across the lower edge of the arch. A half spiral turn, which in this part of its course this process makes upon itself, causes that which in the thigh was its under surface to attain the level and plane of the abdominal surface of the already described portion of Gimbernat's ligament (7 *a*); and this structure it now completes, *by contributing that portion which forms its outer or semilunar margin*, as it pursues its way across the femoral opening, to be implanted ultimately into the ileo pectineal ridge.* (7 *b*, *d*.)

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crural arch is relaxed."—(Monro on Hernia, 1803.) Mr. Allan Burns regards the fascia lata as one of two layers, the membranous texture of the sheath being the other, into which the fascia iliaca divides; and adds that " one passes before the arteria circumflexa ilii, the other behind it; or, in other words, this vessel insinuates itself between the laminæ." (See sec. 12 *h*.)—(Edinburgh Medical and Surgical Journal, vol. ii. p. 267.)

* The constituents of Gimbernat's ligament, as they have been presented in this and the 7th section, were so understood by the earlier anatomists and surgeons; and in Garengeot's writings we have this process of the fascia lata distinctly defined as a seat of stricture in crural hernia.

In 1728, Garengeot (whose Descriptive Anatomy, so far as it goes, appears to the author to be amongst (*d*)—A lamellar extension of this portion of the fascia lata can almost in every subject be traced inwards and forwards beneath the femoral surface of Gimbernat's ligament to the edge of that process of fascia which has been described (11 *d*) as forming the upper and inner half arch of the saphenous border with which it unites; whilst occasionally another process stretched across between the falciform process and the pectineal fascia behind, forms a tolerably strong septum, which divides the upper part of the femoral fossa in a vertical direction. This septum, should it compress the side of the hernial tumour tightly, might in an operation be taken for the seat of stricture, unless the operator is cognisant of its occasional presence.

(*e*)—Having advanced to, and formed the iliac portion of, the margin of the saphenous opening, the iliac fascia lata becomes abruptly reflected back upon itself; in such a manner that, as far as the inner edge of the sartorius and the crural arch, this division of the fascia becomes a double layer.* (Pl. 2, *k*.)

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the most perfect specimens of that class of writing extant) says, "Les attaches (of the crural arch) sont d'un côté à l'epine antérieure et inférieure de l'os des iles, et de l'autre par un fort tendon à la partie supérieure du pubis presque sous le pilier superieur d'anneau. Ce tendon ou ligament est récouvert par une portion de l'aponeurose du fascia lata que s'y attaché, *que lui fournit quelques fibres, et qu'on est obligé de couper dans la hernie crurale.*"—(Splanchologie, p. 92.)

Arnaud, in 1748, also wrote of ruptures, "where the bowels are strangulated by some transverse fibres which run across from the fascia lata to be fixed into the bone of the pubis."—(Op. cit. p. 403.)

To the falciform process of the iliac fascia lata and its terminal fibrous prolongation, the terms the "Femoral," or "Hey's Ligament," have been, in the author's opinion, erroneously applied. Mr. Liston, in his interesting Memoir, after describing this process, says, "This twisted portion is by Mr. Hey named the 'femoral ligament.'"—(Op. cit. p. 10). Mr. Hey's description of the femoral ligament certainly does not apply to these structures; for, according to Mr. H., that ligament is "three-eighths of an inch below Poupart's ligament; and is not situated on the same plane with that of Poupart, *but lies deeper, that is, at a greater distance from the integuments.*"—(Hey's Observations on Surgery, 1803, p. 152.)

Mr. Lawrence, in describing these parts, says, "The upper end, or horn of this crescent, passes in front of the femoral vessels, and bends a little under Poupart's ligament, so as to unite with the thin portion or border of the arch called Gimbernat's ligament, at its commencement." And in a note to this passage Mr. L. says that Mr. Hey "describes the part formed by this junction under the name of the 'Femoral Ligament.'" —(Op. cit. p. 471.)

See some valuable observations on this subject in a work entitled "On some Points connected with the Anatomy and Surgery of Inguinal and Femoral Hernia," by G. J. Guthrie. London, 1847.

For the author's views of Hey's ligament, see notes to subsection *g*.

* The distinction between the fascia lata and the membranous expansions which separate it from the femoral vessels, does not appear to have been clearly understood before Sir A. Cooper undertook the exposition of these parts; and although that distinguished anatomist and surgeon accurately describes the whole of the fascial laminæ on the front of the thigh, he did not record the fact of his ever having traced, what undoubtedly is the case, the continuity of the fascia lata into the "thin fascia," again and again alluded to, as spread out

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The *deep* or reflected layer is thin, and, as it extends outwardly, lies upon the sheath of the femoral vessels (15), and is attached to its front surface by a layer of fine, but firm, fibro-cellular tissue. Immediately behind the crural arch, it is traversed by a band of delicate aponeurotic or ligamentous fibres,—the " Femoral Ligament" of Hey,—(pl. 2, *i*), which would seem at first sight to mark its boundary upwards; but on carefully insinuating the edge of the handle of a scalpel between it and the femoral sheath, and as cautiously advancing it in the direction of the abdomen, this lamina will be seen to extend beyond the upper edge of the fasciculus, as far as the arched borders of the internal oblique and transversalis muscles (pl. 2, *x x*). Here this lamina lies upon the fascia transversalis, and is often so translucent that the outline of another fasciculus, smaller than the ligament of Hey, and situated just above it, can be discerned through its tissue. This band, to be described hereafter, is made up of the " fibræ crassiores " of " the internal inguinal ligament " of Hesselbach (pl. 2, *h*, 15 *g*). The deep layer of the iliac fascia lata loses itself above on the surfaces of the conjoined internal oblique and transversalis muscles; and, whilst to the outer or iliac portion of the transversalis fascia it is inseparably connected, it is most readily separable from its inner or pubic portion; especially if the examination of the two be commenced

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beneath it, and in front of the sheath of the femoral vessels.—(See Anatomy and Surgical Treatment of Crural and Umbilical Hernia, Part 2. London, 1807, pages 6, 7, and 14.)

Since that period this fascia has, with few exceptions, been described by anatomists as consisting of *one* layer, composed of two distinct portions, according as it invests the parts on the iliac, or the pubic, side of the thigh. Mr. Liston, however, who appears to have examined these parts with much attention, says, " The outer or iliac portion, with its falciform process lying on the anterior part of the vessels, is divided into two layers in many subjects; this division is quite distinct without much dissection: in all it can easily be demonstrated." —(Surgical Anatomy of the Groin, by R. Liston. 1819, p. 10.)

(It may probably assist the surgeon in his investigation of these layers to be told, that if an incision be carefully made through the superficial layer in a vertical direction, a little to the outer side of the saphenous border, and the handle of a scalpel be introduced into the opening and passed carefully towards that border, it will be discovered to form a cul-de-sac, and the reflected layer can then be readily subjected to examination.)

Dr. Breschet about the same period gave a very apt illustration of the mode in which the reflected layer is disposed of. " *L'aponeurose femorale* n'est point divisée à la partie superieure de la cuisse; mais elle forme une duplicature très-remarquable, dont la partie inferieure represente un cul-de-sac qui n'a d'ouverture que pour l'artére et la veine femorales; et si l'on examine de près la manière dont se comporte le *fascia-lata* sur ces vaisseaux, on voit qu'il se réfléchit sur eux et se perd sur les parois, comme nous voyons le feuillet extérieur ou fibreux du péricarde se prolonger et se perdre sur les gros vaisseaux qui sortent du cœur."—(Op. cit. p. 129.) Dr. Jones Quain insists also upon this as being the correct account of this fascia. " The iliac fascia lata becomes folded on itself, not ceasing abruptly at the margin of the opening, as at first sight appear. On the contrary, it is reflected on itself, and in the greatest part of its extent passes outwards on the sheath of the vessels with which it is identified." (Elements of Descriptive and Practical Anatomy, 1828, p. 306.)

from their respective attachments to the rectus and conjoined internal oblique and transversalis tendons.*

(*f*)—The ligamentous band appertaining to this layer, just referred to under the name of the " Femoral Ligament of Hey," demands especial attention, as it is correctly supposed to be, in a large proportion of the cases of strangulated femoral rupture, the principal seat of constriction. Its fibres are distinctly aponeurotic, and arise, some in the tissue of the fascial layer with which it is incorporated, behind that portion of the crural arch which gives rise to the innermost of the fibres of the transversalis muscle; others, from some of the coarser of those fibres themselves, to which they appear to stand in the relation of delicate ligamentous terminations; whilst the rest spring from the crural arch at the point of its junction with the fascia iliaca. The fibres approximate and form the band or ligament referred to, which passes across the femoral opening, behind the crural arch, to be inserted into the ileo pectineal ridge at the outer edge of the conjoined tendons (8 *c*), and also in common with the fibres which there terminate the falciform process of the superficial layer of the iliac fascia lata (12 *c*, pl. 2, *h*). Occasionally, a process of the deep fascial layer, with a few of the terminal fibres of this ligament, crosses the conjoined tendons in front, to unite mesially with a corresponding process on the opposite side of the trunk.

(*g*)—The relations of the ligament are as follows:—It is situated at some little distance from, and beneath, the crural arch, the iliac extremity being on its femoral side; but as the whole band has a greater tendency to the horizontal direction than the arch, it follows, that on its way towards the pubes, it attains the level of the posterior thin edge of that ligament, about midway between its extremities. To this edge it is then united by means of a narrow and firm membranous slip—the floor of the inguinal canal—which ceases to exist at the point at which the thin edge referred to merges into the semilunar or free edge of Gimbernat's ligament. It surrounds, and supports, the front wall and pubic angle (15 *b*) of the *sheath* of the femoral vessels, the *orifice* of which it at the same time determines. Thus, it intervenes between the deep thin edge of the crural arch, and the first portion of Gimbernat's ligament, and the sheath of the vessels; and may well be considered as the "deep crural arch." *

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* Mr. Liston clearly recognised the distinct existence of the two layers in this part of their course, but gave a different account of the relations which they hold to each other. Mr. L. says, "The iliac portion (of the fascia lata) forming the falciform process, is again divided into two layers: the one passing anteriorly to the abdominal muscles (according to the text), and named the superficial abdominal fascia; the other, again, lining their inner surface, and passing betwixt the transversalis muscle and peritoneum, *forming the fascia transversalis.*"—(Op. cit. p. 14.) Mr. L. here traces the origin of the fascia transversalis to the deep lamina of the iliac fascia lata; whilst, in the text, Sir A. Cooper's view of its being a layer independent of the fascia lata, is adopted.

(*h*)—Some delicate areolar tissue separates and assists in distinguishing these layers of the iliac fascia lata; and a considerable branch of the anterior crural nerve is seen, making its way to the trunk through an opening in the inferior lamina, immediately below the crural arch; whilst between its under surface, and the sheath of the vessels, the circumflex artery creeps, in order to gain the anterior superior spine of the ilium.*

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* For reasons which I am about to adduce, I believe that this ligamentous band, and not the falciform process of the fascia lata and its fibrous appendage, is the structure to which Mr. Hey directed especial attention, and termed the "Femoral Ligament;" at all events, that its importance demands for it a distinct recognition as such. In the Appendix to Part I. of a "System of Dissections," published by Mr. (afterwards Sir Charles) Bell in 1799, the existence of this structure was pointedly referred to; and in a second edition of that work in 1810, that acute anatomist gave a more definite account of it under the appellation of "the Femoral Ligament," a term which Mr. Hey had in the meantime given it. After a rather confused description of the sheath of the femoral vessels, Sir Charles says, "The dissector endeavouring to push his finger up into the belly by the inside of the vessels of the thigh, feels the sharp edge of a ligament; and when he pushes his finger deep, and again withdraws it, the circular edge of this ligament can be seen."—(Op. cit. p. 7.) And in a Clincical Lecture in 1832, published in the Medical Gazette, vol. x. p. 748, Sir Charles further says, in allusion to the operation for femoral rupture, "All you divide is just the sharp edge of that tendinous arch which stretches across the upper part of the neck of the sac." Mr. Hey was, however, the first to assign that amount of importance to this ligament, which has since been allowed most justly to belong to it. But as Mr. Hey does not appear to have insulated that structure, and thus to have gained a knowledge of its seat and relations sufficiently exact to render his account of it clear to other minds, some misapprehension appears to have arisen, and the terms "the Femoral Ligament," and "Hey's Ligament," have been employed to designate parts, to which, in my opinion, they were not originally intended to apply. Mr. Hey says, "About three-eighths of an inch *below* Poupart's ligament, there exists *in the* aponeurotic sheath (of the femoral vessels) another ligament, somewhat similar to Poupart's, but smaller. It runs transversely, but does not descend obliquely, as this ligament does. On the contrary, it rather ascends as it approaches the symphysis of the ossa pubes, passing behind and decussating Poupart's ligament." Again, Mr. H. describes it as "formed *in* the fascia of the thigh, on the anterior layer of the aponeurotic sheath of the great vessels." These descriptions cannot in any way be made to apply to the falciform process, or its edge, which neither exist "*in* the aponeurotic sheath," nor at the distance of "three-eighths of an inch below Poupart's ligament." Mr. Hey further states, that "a prolapsed intestine would receive very little pressure from Poupart's ligament in comparison of that which it must suffer from this *inferior* ligament, the structure and situation of which account clearly for the peculiar phenomena of femoral hernia." (P. 154.) Now, if the falciform process be the ligament to which Mr. Hey alludes, the reverse of this statement in reference to the comparative amount of pressure which that and Poupart's ligament would have to sustain, is nearer the truth. But it is not a little marvellous, that the reference to this structure in Sir A. Cooper's work, and particularly the note by which it is accompanied, did not have the effect of obtaining for Mr. Hey's exposition a more critical examination, especially as the deeper and more subtle parts of the anatomy of femoral hernia were at that period engrossing the attention of some of the best surgeons. If such had been the case, I feel persuaded the views of the "Femoral Ligament" of Hey, that now prevail, would not have been adopted. Sir A. Cooper has presented us with an account of this ligament, such as he gained as well from his own dissections, as *from a conversation which he had respecting it with Mr. Hey;* not having been, apparently, satisfied either with Mr. H.'s published account of it, nor with the plate by which it was meant to be illustrated. Sir Astley describes it as composed of a *part* of the falciform process, but adds in a note, that Mr. Hey "did not mean to confine the term 'femoral ligament' to the outer fascia alone, *but extends it to the portion of the sheath behind the crural arch.*"—(Op. cit. Lond. 1807, Part II., p. 2.) In the very masterly edition of that work by Mr. Key, it is still more definitely noticed "as a

(*i*)—It is obvious that the extended position of the lower extremity in relation to the trunk must render this ligament tense, and augment any constricting force which it might make upon a hernial protrusion.

(*j*)—This band is liable to thickening of its texture; and in case of long continued and severe pressure, especially from trusses rudely made and badly applied, it may, with the adjoining portions of the neck of the sac, of the internal ligament

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tendinous band, which joins the fascia transversalis to the posterior margin of Poupart's ligament, and *which is quite distinct from Gimbernat's ligament.*"—(Part II. p. 14.) And it may here be remarked, that the operation for relieving femoral hernia advocated by Mr. Key, and many of the most eminent surgeons of the day, viz., that of dilating the structure by cutting this tendinous band forwards, is based upon its recognition as a structure physically, and almost anatomically independent either of the falciform process of the fascia lata, or of Poupart's ligament. Mr. Liston's Memoir, already quoted from, was calculated to give additional consequence and interest to this ligament, by showing that it formed the *true* crural arch; in the author's own words, "that *the crural arch* is formed by a union of the fasciæ *under* the ligament of Poupart," (p. 8); and that "although the ligament of Poupart is removed, still the crural arch remains not much weakened," (p. 13.) And Mr. Liston appears to have been strengthened in his opinion by the large experience which he must subsequently have had of hernial operations and pathology; for in the last edition of his "Practical Surgery" he says, "The neck of the sac is immediately invested on the exterior of its fascia propria, by the *crural arch,*—a very strong band of fibres, the formation and relations of which were, I believe, first clearly pointed out by me in a memoir on the subject published in 1819. The band is formed by the junction of the external and internal (transversalis) fasciæ of the abdominal muscles with the fascia lata of the thigh. It lies immediately under, and is parallel to the ligament of Poupart, and is connected with it by dense cellular tissue," (p. 556.) The account, however, which most nearly accords with that of the text, is from Mr. John Shaw's "Manual of Anatomy," 2nd edition, 1822. By that anatomist, this structure is termed the "*deep* crescentic arch;" and is described as being "formed on the iliac side of the vessels, by a connection between the fascia transversalis and the obliquus internus and transversalis, with part of Poupart's ligament; and on the pubic side, by the same fascia in union with the insertions of the two muscles into the linea ileo pectinea," (p. 60;) and from Mr. Morton's confessedly adopting both Mr. Shaw's nomenclature and anatomical views in relation to this aponeurotic band, I am the more inclined to think that the description in the text, written prior to the author's seeing either the works of Mr. Shaw or Mr. Morton, is its correct anatomical exposition. It will be observed that Mr. Shaw identifies this band with the tissue of the fascia transversalis, whereas, according to the text, it is incorporated with the tissue of the deep layer of the iliac fascia lata; which is, in order, the next lamina above it. It is but fair, however, after having referred to Mr. Morton in corroboration of the dicta of the text on the structure under consideration, to notice the suspicion of its distinctive characters being generally more factitious than real, which, from the following passage, Mr. M. evidently entertains: "There is a good deal of dissection to be made to show this deep arch as a distinct structure, and it may be very fairly criticised as in some degree artificial."—(Op. cit. p. 127.)

* Compare this account of the tract of the circumflexa ilii artery, with that given by Mr. Burns, to be found in the note to section 12.

of Hesselbach, and of the crural arch, become matted together into one, and that an almost undefinable mass. These changes, however, do not so frequently, or so extensively, occur in the pubic terminal portion of this ligament, on account of its remoteness from one or more of the sources of mischief here alluded to, and the comparative paucity of the textures by which it is immediately surrounded.

(*k*)—The *pubic* portion of the fascia lata is a single layer applied upon the pectineus and long adductor muscles, and the deep pudic artery and vein in the upper and inner part of the thigh. It is continuous with the inner and lower half arch of the saphenous margin, or Burns's ligament; and indeed results from the gradual unfolding of the double layer of which it is constituted. At the inner edge of the thigh it is connected with the superficial fascia, and receives the ultimate fibres of the inner and upper half arch of the saphenous opening (11 *d*); on the outer side it is attached, in common with the posterior edge of the fascia iliaca, to the ileo-pectineal eminence, and below, to the structures along the outer edge of the pectineus muscle (6); whilst above, it is implanted into the ileo-pectineal ridge and pubic tuberosity, immediately below and in common with, the terminal portions of Hey's (12 *f*) and Gimbernat's ligaments (7 *c*).*

Its front surface slopes from within outwards and backwards, in accordance with the disposition of the ramus of the pubis and the subjacent surfaces of the pectineus and adductor longus muscles; and forms the pubic boundary or basement of the femoral fossa; whence I have applied to it the term *pectineal fascia*. The pubic wall of the sheath of the femoral vessels impinges upon and is attached to the portion of this fascia that skirts its outer edge; and to this portion is also attached the posterior or deep edge of the cribriform fascia. In complete femoral herniæ, it forms the floor upon which the protruded mass rests.

(13)†—The last portion of the *saphenous vein* enveloped by its sheath (18), and receiving tributary branches from the adjacent parts, may now be seen bound to the subjacent fascia lata, by laminæ from the superficial and cribriform fasciæ, as it makes its way over the edge of the inferior saphenous arch, to join the femoral trunk. Its coats often become thickened, according to the amount of pressure to

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[*] Scarpa makes this portion of the pubic fascia lata to be inserted into Gimbernat's ligament. "Arrivée près de l'insertion du ligament de fallope au pubis, elle passe au-dessous de la lame externe et s'insère tout le long de l'axe longitudinal du ligament de Gimbernat."—(Supplement aut Traité Prat. p. 35.)

[†] In dissecting the fasciæ of the thigh, the saphenous vein is one of the most certain and valuable landmarks, as it separates the superficial fascia from the fascia lata; and the margin of the saphenous aperture found beneath it, will afford a clue to its remaining portions.

which they have been subjected. In recent herniæ, when much pressure is made on the venous septum (19 *a*), the vein becomes varicose; and this condition has been looked upon as a criterion of the degree of constriction to which the rupture is subjected; but in cases of *long standing rupture*, this symptom cannot be depended upon, for the femoral vein, as in the subject from which the second plate was taken, may become diminished in calibre, or, as in other instances, obliterated; and the part of the circulation previously allotted to the saphenous, becomes thrown upon other tributary branches of the femoral. A varix of the last portion of this vein is an occasional occurrence, and has been mistaken for and treated as rupture; but the partial or general dilatation of other portions of the vein with which this affection is usually accompanied, is sufficient, with other indications, to show its true nature.*

(14)—The *cribriform* fascia is oval shaped, partly reticular and partly membranous; situated within the saphenous opening, and stretched upon that portion of the walls of the sheath of the femoral vessels which remains unprotected by the fascia lata. It has by some anatomists been considered as a perforated portion of the fascia lata,† which is obviously an error; for this fascia, as we have seen, after forming the edges of the saphenous opening, is reflected outwards upon itself;—by others, it has been regarded as a "deep lamella of the superficial fascia;"—whilst by a third party it has been confounded with the femoral sheath itself, and termed its cribriform portion.‡

I have been led to dissent from these views, and to concur with the opinion of those who look upon the cribriform as a distinct lamina, having peculiarities of structure and function which entitle it to be so considered.

(*a*)—It is firmly attached to the under layer of the iliac fascia lata, immediately within and behind the edge of the falciform process and external boundary of the saphenous opening;—to that process of fascia reflected from the inner and upper half arch of the saphenous opening, which is applied against the femoral surface of Gimbernat's ligament (12 *d*), immediately behind the crural arch; and to the pectineal fascia, along a line drawn vertically from the point where it is joined by the process of fascia just referred to, to the inner side of the saphenous vein.* From these several points it may be traced to the saphenous vein, upon the vaginal sheath of which it is prolonged and eventually lost; which, with the assistance of the deep laminæ of the superficial fascia, and the tissues which occupy the femoral fossa, it binds down to the parts beneath.

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* Cases of this kind have been recorded by Petit, Sir A. Cooper, Mr. Macilwain, and others. In an instance of this affection, which occurred in the practice of the last-mentioned author, the tumour did not exactly occupy the situation of femoral rupture; accordingly, the parts were examined more accurately, and Mr. M. found "that the small cutaneous veins were in an enlarged condition, minute inspection showing the thigh to be variously studded with little clusters of venous ramifications; and in tracing the vena saphena up the thigh, the nature of the tumour was sufficiently manifest."—(Surgical Observations, p. 300.)

Mr. Lawrence observes, that a saphenous varix "might be the more readily mistaken for a rupture, since it admits of being reduced by pressure, increases by coughing, exertion, and the erect position, and is not perceived in the recumbent posture."—(Op. cit. p. 496.)

† "The opening in the fascia lata through which the absorbent vessels reaches the femoral sheath, is generally rendered cribriform by these vessels passing through a variety of small openings."—(Op. cit. Edited by Mr. Key, p. 3.)

‡ See Morton's Anatomy of Crural Hernia, p. 103.

(*b*)—The meshes or openings in this fascia, by which the absorbent vessels from the lower extremity find their way to the trunk, are principally in those portions which are situated below and behind the crural arch, and which border upon the adjoining portion of the pectineal fascia. They are of various sizes, one being generally larger than the rest;† and beside absorbent vessels, they are usually occupied by fat, sometimes lymphatic glands, and nervous filaments.

(*c*)—The plane of the *upper* surface of this layer is angular to that of the corresponding surface of the thigh; so that it slants, and that from the outer edge of the saphenous opening backwards and inwards, until it reaches the front surface of the *pectineal* fascia. Its front surface forms the outer boundary of the *femoral fossa* (22 *b*), and is in contact with some of the deep lamellæ of the superficial fascia and the other contents of that space. From its structure and relations, it is obviously designed to protect that side of the femoral vein, and other parts which have no covering from the fascia lata; and at the same time to permit the transit of the absorbent vessels towards the general trunk.

(*d*)—This fascia generally yields before a *complete* hernial protrusion, and forms a covering for it external to the fascia propria (20 *a*). Sometimes the opposing surfaces of these two hernial coverings become closely and inseparably adherent to each other; but as far as my examinations have gone, I have generally found them distinct and readily separable, and the inner surface of the former layer even glistening. Its outer surface, however, which is less smooth, often becomes blended with a thick and heterogeneous layer of fat, absorbent vessels, glands, small veins, and cellular tissue, which is formed by gradual compression from the contents of the femoral fossa; and by which it is in many instances united to the fascia superficialis. The absorbent vessels pass up along the inner wall of the hernial covering thus formed, towards their respective apertures, and are with difficulty discoverable amongst the various textures by which they are enveloped. After having once yielded, the cribriform fascia admits of subsequent and gradual distension, equal to that of any of the other coverings of a hernial tumour; and according to the amount of protrusion, and the size of the tumour, so it will be made to encroach upon the femoral fossa, and thus proportionally to diminish the capacity of that space; whilst its relation to it, as the external wall or boundary, remains unaffected thereby (22 *b*).

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* On account of this connection, Mr. Burns described this fascia as "a process or duplicature" of "the pectineal aponeurosis;" situated about "an inch and a half below the crest of the pubes, to be inserted into the under surface of the fascia lata at a very little distance from the falciform process; and this duplicature divides the superficial vein and lymphatics, which enter with it completely from the large vessels lying beneath the fascia; and over the edge of this process we, in general, find an oblong conglobate gland folded."—(Edinburgh Medical Journal, vol. ii. 1806, p. 269.)

† "If the sheath be clearly dissected," says Sir A. Cooper, "and the finger be thrust into it from the abdomen, the cellular member and absorbent vessels are protruded through one of these holes, which is larger than the rest." Sir Astley found this to be especially the case in the *male* subjects which he dissected. —(Op. cit. p. 9.)

(*e*)—Should the tissue of this fascia be so strong as successfully to resist the force of a protruding hernia, and one of the openings be unusually large, as sometimes happens with that through which the principal absorbents pass, a pouch from the sac might insinuate itself into such opening; and, by the gradual dilatation of the one, and expansion of the other, a complete hernial tumour would in this manner eventually be formed, of course without the covering, which usually intervenes between the fascia propria and the fatty layer, described in the last section.*

I do not find such a case on record, but there is every reason for believing that strangulation of the contents of such a sac might be effected by the borders of the opening in question; and this should be borne in mind, for the seat of stricture, under such circumstances, would be found immediately behind and rather below the pubic extremity of the falciform process.

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* A. Monro, jun., recognised this as one of the usual varieties of femoral hernia. Sir A. Cooper dissected such a case and described it (on Crural Hernia, p. 56) as follows:—"On examining the femoral sheath, I found that its inner side had given way, and a small hernial sac had been produced through the opening by which the absorbents usually pass." And Breschet remarks,—"Le péritoine pousse devant lui, le fascia propria, et d'autres lames celluleuse-fibreuses, perforées pour le passage des ganglions lymphatiques, ou des vaisseaux absorbants. *Il est possible* que le sac formé par une membrane mincé, contenant de la sérosité, s'engage dans une ou dans plusieurs de ces ouvertures.—(Op. cit. p. 43.)

Hesselbach has given a plate of femoral hernia in the male subject where five distinct protrusions of portions of a hernial sac had taken place through the openings in this fascia.—"Haud raro contingit ut in subjectis masculis sacci hernialis corpus aut duplex, aut in plura divisum loculamenta appareat; scilicet cum tendinosi textus retiformis fasciculi in lamina externa sacci hernialis impetui restiterint, ille ipse per textus intervalla prorumpit."—(Op. cit. p. 45.)

I cannot concur in the opinion of Malgaigne, that hernial protrusions *commonly* take place in the manner just described.*

Cysts, encysted and fatty tumours, and suppurating or diseased lymphatic glands, are not unfrequently met with on the outer surface of this fascial covering.†

(15)—Remove the iliac fascia lata and the cribriform layer carefully, and the front wall of *the sheath of the femoral vessels* will come into view; but, in order to examine the whole, it will be necessary at the same time to open the abdominal cavity, and detach the peritoneum with the subjacent cellular and other tissue from the lower portion of its front wall, as well as from the iliac fossa and vessels.

(*a*)—In this manner the upper or abdominal aperture of the sheath will be exposed; and it will be seen to be a trilateral membranous canal, commencing behind the crural arch, and continued down the thigh as an investment for the femoral vessels.

(*b*)—It is lodged in the femoral opening (4), and the triangular fossa, formed by the oblique surfaces, of the iliac fascia on one side, and of the pectineal fascia on the other, and is covered in front by the crural arch, the two layers of the iliac fascia lata, the superficial fascia, and integuments It is, therefore, convenient, for the sake of describing its relations more clearly, to consider the sheath as constituted of a front or tegumentary, an iliac, and a pubic wall; (pl. 3, fig. 1, *a*, *b*, and *c*); and of three angles, formed in those parts of the sheath respectively where these several walls meet and unite with each other. (Pl. 3, fig. 1, *d*, *e*, and *f*.) These angles are not acute, like those of the containing femoral opening and fossa, but are rounded off.

(*c*)—It is moreover a funnel-shaped canal, as might be readily seen by a reference to its front wall, (pl. 3, fig. 1, *a*,) having, a width at its orifice commensurate with the distance between the lunated edge of Gimbernat's ligament and the point of junction between the crural arch and the fascia iliaca, and therefore, considerably more than sufficient room to accommodate the femoral artery and vein; whilst immediately below the entrance of the saphenous into the femoral vein, by a gradual but rather sudden contraction of its calibre, the sheath embraces those vessels closely, and becomes intimately blended with the outer cellular coat, by which they are, from that point for the remainder of their course, enveloped.

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* Malgaigne goes farther still, and says,—" *En general* elle (la hernie) se fait jour (on passing beyond the crural canal) par un trou du fascia cribriforme voisin du ligament de Poupart, immediatement au-dessous du repli falciforme de la prétendue fossa ovale."—(Leçons Cliniques sur les Hernies, Paris, 1841, p. 183.)

† " Il n'est pas rare non plus de trouver au-dessous du fascia superficialis un paquet de tissu adipeux de forme ovalaire, qu'on peut séparer des parties voisines, et qui présente quelque resemblance avec une portion d'épiploon."—(Breschet, Op. cit. p. 170.)

(*d*)—The earliest distinct recognition of this sheath, in its relations to femoral rupture, is, I believe, to be found in the work before alluded to, of Don Antonio Gimbernat, whose description was not surpassed, either in point of accuracy or clearness, but by the profound and brilliant discoveries of Sir A. Cooper in reference to this department of the anatomy of femoral hernia. Gimbernat's anatomical account of this sheath is as follows:—A lamina of the fascia iliaca (the pectineal) passes over the pectineus muscle, and is attached to the crest of the os pubis, where it is united with the ligamentous expansion which bears his name and terminates on the same crest. "By this union is formed a species of ligament which passes along the crest immediately above the insertion of the superior extremity of the pectineus muscle; from this division of the crural arch, an aponeurotic sheath arises at the top of the thigh, beginning at the crural arch itself, close to the body of the pubis; so that the expansion which has been described, *and which is sent from the internal edge of the arch*, passing behind the iliac vessels, forms the posterior wall of the sheath, whilst the anterior wall is formed by the external edge of the fascia lata." The grave defect in this account may be attributed almost entirely to the fact that Gimbernat did not recognise the existence of a fascial layer distinct from the fascia lata, and intervening between that lamina and the femoral vessels,—a discovery which remained to signalize the triumphs of Sir A. Cooper's labours and genius.

Sir Astley described the sheath as constituted "anteriorly by the descent of the fascia transversalis, and posteriorly by a similar process from the fascia iliaca; and by the union of these at the inner and back part of the sheath, the bag is rendered complete."*

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* The discovery of the fascia transversalis, and its exact relations to the parts concerned in the formation and strangulation of a femoral hernia, is one of the most interesting and important achievements of modern anatomy, and will, I trust, be accepted as an apology for a digression, which has for its object, a detail of the various steps by which it was ultimately accomplished. The cord or round ligament was supposed by Albinus and Heister to make its escape from the abdominal cavity through an opening in the oblique and transversalis muscles. "Perforatis sive annullus in parte inferiore obliqui descendentis, ascendentis et transversalis." (Heister, Compar. Anat. edit. 2nd. p. 55.) This error was corrected by Heister's contemporary, the learned Garengeot, who admitted that he derived his first ideas of what he conceived to be the structure of these parts from the "Anatomiste et très-habile Chirurgien," M. Petit; and stated them in the following passages, taken from the 2nd edition, tome i. of his Splanchnologie, 1742. "C'est donc une erreur très grande de soutenir

According to my examinations of this structure, both before and subsequent to maceration of the parts, it appears to be formed in the following manner:—The *inner* portion of the fascia transversalis being extended behind the crural arch downwards into

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qu'il y ait un *trou* ou un anneau au *muscle transversal,* pour laisser passer les vaisseux spermatiques." . . . "On voit que les dernières fibres du transversal sont charnues et attachées à l'épine antérieure inférieure de l'os ses iles, qu'elles forment ensuite un bord charnu, qui descend obliquement pour venir s'attacher sur la partie supérieure du pubis, à l'endroit on s'attache le ligament de fallope. Ainsi les vaisseaux crureaux, avec leur allongement du péritoine, et celui qui accompagne les vaisseaux spermatiques, *ou les ligaments ronds, passent sous ce bord charnu,* sans qu'il y ait d'autre trou, ni d'autre anneau au muscle transversal, q'un éspace assez long et large de deux petits travers de doigts, qui se trouve entre ses dernières fibres et le pubis . . . Ces observations," continues Garengeot with much truth, "tendent non seulement à une plus grande perfection de la science anatomique, mais à conduire plus surement dans les opérations de chirurgie."—(P. 138, et seq.) It must however in deference to the opinions of Albinus and Heister be submitted, that occasionally the cord or round ligament does pass between the fibres of the transversalis muscle in its passage from the abdominal cavity; Mr. Guthrie (see Op. cit. p. 13) affirms this to be the case sometimes; and I have seen one instance of this arrangement in the course of my dissections.

Having advanced so far, another question was raised which led to much discussion between these anatomists; and this had for its solution the nature and connections of the structure immediately surrounding the iliac and femoral vessels,—in short, of their sheath;—and in the writings which resulted, we have probably the earliest distinct references to the structure now known as the fascia tranversalis. Ruysch had already observed a tissue which separated the peritoneum from the lower portion of the abdominal muscles, which was afterwards currently known as the "cellular substance of Ruysch." This tissue Heister looked upon as one of the two layers of membrane, of which, at that period, the peritoneum was commonly supposed to consist. Garengeot admitted the fact that such a layer existed, especially between the peritoneum and transversalis muscle; but was opposed to the views of it which Heister entertained. "Chaque fois," continues Garengeot, "que j'ai enlevé le muscle transversal, j'ai vu dans les sujets gras, et y avoit beaucoup de graisse entre les fibres charnues et le péritoine; mais quand j'étois parvenu *à l'aponeurose intérieure et semilunare du muscle transversal,* je la trouvais si adhérent avec le péritoine, quoique je ne me servisse que d'une lancette pour cette dissection et que je la fisse avec toute l'attention et la délicatesse requîse, il m'étoit presque impossible de mettre le péritoine à nud sans lui faire quelques trous."—(P. 175, Op. cit.) But whilst Garengeot refused to sanction Heister's explanation of this lamina, he appears to have had no other alternative than to adopt one so analogous to it that the distinction might be said to amount to a quibble. He termed it one of the five "productions" given off from the outer surface of the peritoneum. "*La seconde paire des productions* est construite de ces allongemens *follículeux* qui beaucoup d'anatomistes ont omis, *et qui accompagnant pendant quelque chemin les vaisseaux crureaux, passent avec eux sous le* ligament de fallope, ou sous ce que les chirurgiens appellent l'arcade crurale."—(P. 181.)

The next advance was made by Gimbernat, who thereby gave a right direction to the labours of succeeding anatomists. This distinguished surgeon recognised a purpose in the tissues, about the structural and anatomical peculiarities of which his predecessors had been so vainly contending, and brought out into relief *the femoral sheath* (as it was from that period termed), and its relations to hernial protrusions. (For his description of the sheath see the text.) As we have seen, his account was fundamentally defective; but the subject had excited so much attention, in this country especially, that during the years 1802, 3, and 4, the two Burns, Dr. Monro, and Sir Astley, then Mr. Cooper, were simultaneously occupied in the investigation of these parts. Mr. Allan Burns, who with the assistance of his brother made his researches in 1802, describes a fascia, one of two laminæ into which the fascia iliaca divides, which "is inserted into Poupart's ligament all the way from the thigh in front of the femoral vessels, constitutes the front wall of their sheath; * whilst lateral expansions of this process,—each taking a converse direction in relation

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the spine of the ilium down to the point beneath which the femoral artery emerges from the abdomen." . . . . "It turns upwards along the internal surface of the abdominal muscles, forming an internal fascia."—(Edinburgh Medical and Surgical Journal, 1806, p. 267.) It does not appear that Mr. Burns had seen Mr. Cooper's work when the paper from which these extracts were taken was published.

Dr. Monro (secundus) described the ***sheath;*** but it will be observed that the account very nearly agrees with that given by Gimbernat, not only as far as the anatomical relations of its component parts are concerned, but also in the terms employed in describing them. It is formed in front "by the upper and inner portion of the fascia lata of the muscles of the thigh;" . . . at its back part "by the continuation of the tendinous aponeurosis of the internal iliac muscle, which passes behind the external iliac vessels, and is inserted close to the external edge of the pectineus muscle. . . . Another portion passes over the pectineus, and is inserted into the ossa pubis."—(Observations on Crural Hernia, &c., 1803, p. 53.)

Sir Astley Cooper's discovery and description of the fascia transversalis in its totality, which was published in 1804, made the composition of the femoral sheath more clear and satisfactory (see text). "This fascia," says Sir Astley, "which I have ventured to name Fascia Transversalis, varies in density, being strong and unyielding towards the ilium, but weak and more cellular towards the pubis. Midway between the spine of the ilium and the pubes, the opening will be seen which is now generally known as the internal abdominal ring; the edges of it are indistinct, on account of its cellular connections with the cord: when these are separated, the fascia of which it is formed will be found to consist of two portions; the outer strong layer (portion) *connected to Poupart's ligament,* winds in a semilunar form around the outer side of the cord. The inner portion, which is found behind the cord, is attached to, but less strongly connected with the inner half of the crural arch, and may be readily separated from it, by passing the handle of a knife between it and the arch. It ascends behind the tendon of the transversalis, with which it is intimately blended, passes around the inner side of the cord, and joins with the outer portion of the fascia above the cord, being at length firmly fixed in the pubes."—(Op. cit., edit. 2nd, p. 6.)

* In forming the femoral sheath, Sir A. Cooper, Mr. Key, and Mr. Lawrence, concur in representing the process of fascia transversalis, which constitutes its front wall, not only as passing immediately behind Poupart's ligament, but as forming a connection with its posterior thin edge. "The fascia transversalis," says Mr. Key, "may now be easily separated from the posterior edge of the crural arch by the handle of the knife." (Op. cit. Part I. p. 12.) According to the text, this process of the fascia transversalis has only an indirect connection with the crural arch, and that through the medium of the intervening deep lamina of the iliac fascia lata, with which the aponeurotic fibres of Hey's ligament are incorporated (12 *e, g*). The connection between these two laminæ is not so firm but that they might be easily separated; and from comparing the attachments of one to the edge of the tendon of the rectus, and of the other, by the terminal fibres of Hey's ligament, to the edges of the conjoined tendons, it will be obvious why, in the operation advocated by Mr. Key, and modern surgeons generally, of dilating the stricture, when external to the neck of the sac, by a division of that ligament, (identical with Mr. K.'s "tendinous band, which joins the fascia transversalis to the posterior margin of Poupart's ligament,") there is no necessity, as Mr. K. distinctly states, for dividing any portion of the former membrane as it passes over, and has in consequence been erroneously termed the upper lamina of, Gimbernat's ligament (7 *c*). Mr. Lawrence's statement that the innermost portion of the fascia transversalis "is connected by its inner edge to the *margin of the rectus abdominis, and to the inferior margin of the tendon* of the obliquus internus and transverseus," (Op. cit. p. 189,) seeing that Gimbernat's ligament interposes a septum between the outer edges of these two tendons, at the points of their attachments to the bone, can only be elucidated by the admission of the distinct, and separate, existence of the two laminæ referred to.

to the other,—contribute the iliac and pubic walls. These unite *behind* the vessels, and in this manner complete the sheath. Thus, in the part of the thigh under consideration, the sheath is wholly formed by an extension of the fascia transversalis.

The outer surface of the *pubic* division of the sheath is closely united at its upper or abdominal orifice to the cartilaginous-like tissue which coats the upper and front surface of the ramus of the pubis, from the point at which the outer edge of the tendon of the rectus is inserted into that bone to the ileo-pectineal eminence; and from above downwards it is moreover applied against a portion of the upper surface, and lunated edge, of Gimbernat's ligament, the terminal portion of Hey's ligament (12 *f*), the opposing surface of the cribriform fascia, and a slip of the pectineal fascia along its outer edge, to which it is attached; whilst the *iliac* wall lies upon, and coalesces with, the front surface of the fascia iliaca.*

(*f*)—If the sheath be completely denuded, and examined for the purpose of observing the peculiarities of its fibrous arrangement, the uppermost fibres of the front wall will be found to take almost a transverse direction; but the lower fibres gradually take a more oblique course upwards and inwards in their course towards the ileo-pectineal crest. Thus the mean line of tension of the sheath is nearly at right angles with the long axis of the neck of an ordinary hernial tumour. Some curved and obliquely-directed aponeurotic fibres are developed in, and strengthen the tissue of the posterior *angle* of the sheath,—alternating with portions of the ordinary sheath membrane, which are thin, and occasionally even cribrous.†

The general disposition of these *fibres* can only be traced in those subjects, in whom its parietes are more strongly developed than usual.

(*g*)—Immediately behind, and at the average distance of a line, or even less, above the crural arch and Hey's ligament, there is uniformly to be found a small but firm band of ligamentous fibres imbedded in, and therefore forming a part of the texture of the sheath itself. It is formed in the outer portion of the fascia transversalis, above and behind the muscular attachment of the transversalis muscle to the crural arch, by a number of distinct fibres, some of which arise from the adjoining muscular fasiculi, others insensibly in the fascia itself. It then crosses the front wall and pubic angle of the sheath, and the upper surface of Gimbernat's ligament, to be inserted into the crest of the pubis, and the outer edge of the tendon of the rectus; whilst a few of its fibres diverge ere they reach that tendon, and become interwoven with those aponeurotic fibres which lie parallel to, and strengthen the inner edge of, the fascia transversalis. If the point of the finger, inserted into the sheath through its upper orifice, be gently pressed forwards against the inner surface of its front wall, this ligament will be observed distinctly to indent it; and by passing the finger towards the pubis or in the opposite direction, its course and destination will be made very evident, and at the same time, a just idea be obtained of the amount of constricting power which it is capable of exercising upon a hernial protrusion. It appears to be identical with the band of ligamentous fibres described by Hesselbach as "fibræ crassiores ligamenti inguinalis interni," and represented very clearly in the third plate of his work, "De ortu et progressu Herniarum," 1816.*

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* According to my observations, the front wall of the sheath does not terminate abruptly by uniting its outer edge with the adjoining portion of the fascia iliaca, but is continuous over the front surface of this fascia, with which in the greater part of its extent, it is so consolidated, that even after maceration, the sheath membrane can be removed but in fragments, and only from those parts of the fascia lata immediately bordering on its front and posterior edges. This arrangement is rendered still more apparent by a reference to the triangular spaces which remain between the sharp angles of the femoral opening, and the *rounded angles,* which the walls of the sheath form at the points of their union with each other (15 *b*). The correctness of this statement receives further confirmation from the different courses which the fibres belonging to these laminæ are observed respectively to take; which Dr. Monro noticed as follows:—"A *tendinous* aponeurosis composed of *longitudinal fibres, which are crossed by other thin* fibres, covers the internal iliac muscle, and is intimately united with the crural arch, so that crural herniæ can only happen on the inner side of the external iliac vein."—(Monro on Hernia, 1803.)

† See 21 *b*.

(*h*)—The cavity of the sheath is divided vertically into three compartments, of nearly equal capacity, by two strong septa, (pl. 3, fig. 1, *g h*,) which are stretched rather obliquely across from the front to its iliac wall. In the outermost of these compartments the femoral artery is lodged; in the central, the vein; whilst the third, or that between the venous septum and the pubic angle of the sheath, transmits absorbents from the lower extremity. This compartment, from its being also the usual outlet for a femoral hernia, is termed *the femoral canal*[*] (pl. 3, fig. 1, *k*); and its abdominal orifice, (pl. 3, fig. 1, *i*,) the *femoral ring*.

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* After giving a concise account of the fascia transversalis, under the title of the "Ligamentum Inguinale Internum," Hesselbach continues, "Maximam partem fibris subtilioribus ex parte etiam crassioribus conficitur quæ ad directionem ligamenti inguinalis externi (Poupart's ligament) obliquè extrorsum sursumque vasa cruralia, quæ ligamentum attingit, quæque fasciculis subtilioribus circumvolvit, transeunt; extrorsum prope arteriam cruralem fibræ crassiores cum psoæ majoris et musculi iliaci interni aponeurosi ad cristam ossis coxarum usque committi incipiunt. Vasa denique cruralia inter cristam ossis coxarum obliquâ directione extrorsum sursumque à fibris crassioribus aliæ subtilioribus secedunt; reliquæ autem subtiliores a ramo ossis pubis horizontali ortæ recta ascendunt."—(Op. cit. p. 10, 11.)

Mr. Cooper, in the seventh edition of his "Dictionary of Practical Surgery," p. 734, gives the following account of this band of fibres, which he gathered principally from the work of Langenbeck:—"The fascia transversalis has some strong fibres which proceed inwards under the internal opening of the inguinal canal, of which they form, as it were, the bottom. . . . . They go over the femoral artery and vein, are connected above with the fascia of the transversus muscle, and below are continued into the fascia of the psoas and iliac muscles. Where these fibres pass over the femoral vessels, they expand into a firm aponeurosis, which passing downwards is intimately attached at the inner side of the femoral vein to the horizontal branch of the os pubis, close to the symphysis, and then joins the aponeurosis of the recti muscles." This ligament forms a part of that process of the fascia transversalis, which Mr. Key describes as passing to the linea ileo pectinea; and which, from its connections with Gimbernat's ligament, has given rise to "the erroneous idea of the latter consisting of two layers."—(Op. cit. Part I. p. 12.) (7 *c*, and note.)

(*i*)—Some delicate fibro-cellular tissue, arranged concentrically around each of the femoral vessels, occupies the space between them and the parietes of their respective compartments, and attaches them to the iliac wall of the sheath; hence the vein is situated on a plane below that of the artery.

(*j*)—At the upper part of the pubic *angle* of the sheath,[†] immediately below the falciform process and adjoining portion of Hey's ligament, is an elliptical opening in its walls, (pl. 3, fig. 1, *m*,) the front margin of which corresponds with, and is immediately beneath the iliac margin of the saphenous opening. In order to get a view of it, the cribriform fascia should be carefully cleared away. This opening is bisected by the lower edge of the septum which separates the venous from the absorbent compartment of the sheath; and thus two distinct apertures are formed for the passage of their respective vascular contents.

(*k*)—The pubic *septum*[‡] of the sheath is generally stretched by a hernial protrusion; but, as it yields, its tissue sometimes becomes thickened, and thus affords a protection

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Although this band might appear to be so far above the plane of the orifice of the crural canal as to be incapable of exerting any influence on its hernial contents, such is not always the case. The results of long-continued inflammatory action in the tissues composing the femoral ring are a thickening and amalgamation of parts, which, in their natural condition, are distinct from each other; and in this manner this and Hey's ligaments frequently become so combined in their actions upon a hernia, that supposing the seat of stricture to be essentially in the latter, the strangulated parts will not be released until both are divided.

[*] Mr. Guthrie considers the *sheath* to be completed by the septum on the pubic side of the vein; consequently that the femoral canal ought not to be considered as forming a part of it.—(Op. cit. p. 30.)

[†] "Through the inner side of the sheath next to the pubes, pass the femoral absorbent vessels into the abdomen. In the male subject, I have seen them enter the sheath in a cluster, through a single hole in this fascia; but in both sexes the fascia is generally rendered by these vessels passing through a variety of small openings; *but, nevertheless, if the sheath be clearly dissected, and the finger thrust into it from the abdomen,* the cellular membrane and absorbent vessels are protruded through one of these holes, which is larger than the rest." I believe this passage from Sir Astley Cooper's work refers to the sheath, and not to a fascia external to it. This is the "weakest part of the sheath," referred to by anatomists generally.—(See Tuson's Anatomy and Surgery of Inguinal and Femoral Hernia, p. 9.)

[‡] This septum was known to Gimbernat, and Mr. Burns justly notices the power which it has "to bind down the crural arch more firmly, and to connect it better and more firmly to the bone."—(Op. cit. p. 268.)

to the parts on its iliac side against the consequences which might otherwise accrue to them from the pressure of a hernial tumour.

The injuries inflicted on the vessels by this pressure vary, according to its amount and duration, from merely mechanical compression, to permanent contraction of their walls, and even to their entire closure.* The vein is of course most prone to be thus affected, and becomes in most instances, more or less pushed a little behind the artery. The *permanent* results are comparatively but of little importance, on account of the readiness with which any consequent defect in the circulation of the parts is made up by the establishment of adequate collateral channels. †

(16)—The *crural canal* is formed externally by the septum on the pubic side of the femoral vein, and internally, by the pubic *angle* and *wall* of the femoral sheath.

(*a*)—The canal takes an oblique course downwards, and rather forwards and inwards, to the inner and front part of the thigh, (pl. 3, fig. 1, *l*,) where it terminates in the upper of the two openings in the pubic *angle* of the sheath just referred to (*k*), and which is in reality its " lower orifice," (11 *f*,) (pl. 3, fig. 1, *m*.) For an account of the relations of this part of the canal the reader is referred to sub-section (*e*).

(*b*)—The *openings* of the crural canal are covered in by fascial laminæ, which will be hereafter described, (17, 18).

(*c*)—The *femoral ring* ‡ (15 *h*) being but the upper orifice of the *canal*, has the same constituent parts; but it has relations peculiarly its own, and of the utmost importance to hernial protrusions.

(*d*)—The parts which bound the *ring* below the superficial fascia, in their order from without inwards, are, in front, the outer portion of the inner third of the crural arch, and the portion of Hey's ligament which skirts, and is connected with, its posterior thin edge; which ligament, in accordance with what has already been stated, is situated immediately below that which appertains to the tissue of the sheath itself (*g*), (pl. 3, fig. 1, p. 2); whilst the portion of the ring, contributed by the pubic *angle* of the sheath, is attached to, and has its limits in the direction of, the pubis, determined by the lunated edge of Gimbernat's, and the adjoining portion of Hey's, ligaments. (pl. 3, fig. 1, *r*.) Behind, the ring is bounded by the front surface of the ramus of the pubis, and that prolongation of Gimbernat's ligament which is occasionally extended along the whole length of its ileo-pectineal crest (7 *a*); and on the outer side, by the pubic septum of the femoral sheath. Constriction occurring at this portion of the crural canal is most generally occasioned by the unyielding nature of these ligamentous or fibrous tissues; and in the majority of cases, the simple division of Hey's or Gimbernat's ligaments, or of these and the band of fibres immediately above them, is sufficient to afford complete relief to the contents.

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* Cloquet records a case in which the pressure of an omental femoral rupture, produced a varicose state of the vein (saphenous) and a partial obliteration of the femoral artery.—(Pathologie Chirurgieale, p. 88.)

† In a preparation in my possession, both artery and vein were lessened in size, and the supply of blood to the extremity was maintained by the enlargement of the external circumflexa ilii and obturator branches of the external iliac.

‡ " The femoral aperture " of Sir A. Cooper, " between the lunated edge of Gimbernat's ligament and the inner side of the femoral vein."—(Op. cit. 2nd edit. Part I. p. 10.)

Mr. Hey says, " The union of the falciform process of the fascia lata with Gimbernat's ligament, together with the sheath of the great vessels, form a ring, through which the femoral hernia descends, and by which it is compressed in the strangulation."—(Op. cit. 2nd edit. 1810.) Mr. H. makes no allusion to the sheath as a distinct membranous canal in the edition of his works which appeared in 1803; it is therefore probable that this surgeon's first views of this theca were derived from Sir A. Cooper's work.

(*e*)—A hernial tumour causes dilatation of the femoral ring, and then of the contiguous soft parts, in their order eccentrically; thus, a stricture at the ring, which might at first be caused by the textures which form its extreme edge or margins, would by their gradual dilatation at length extend to, and be aggravated by, the parts immediately encircling them; and in proportion to the tightness of the constriction, would it be necessary to divide more or less of the latter as well as the former textures (7 *d*, note.)

(*f*)—The plane of the upper orifice of the canal being almost at a right angle with that of the lower, it follows from that and the oblique direction of the axis of the canal, that its walls are of unequal length. That constituted by the *pubic angle* of the sheath, and placed behind the innermost portion of the falciform process of the fascia lata and the adjoining portion of Gimbernat's ligament, is the shortest, being in heighth but a little more than equal to the breadth of the former process (pl. 3, fig. 1, *t*).

(*g*)—A layer of areolar tissue which in some subjects assumes a decidedly laminar or fascial character, adherent to the edges of the *femoral ring*, spreads itself over the upper orifice of the femoral canal; whilst its lower outlet—that belonging to the sheath—is occluded by another fascial layer. The first has been termed by Cloquet the "Septum Crurale;" the other by Burns, on account of peculiarities yet to be described, the "Vaginal Sheath" of the saphenous vein.*

(17)—*The septum crurale* is composed of areolar tissue, with which coarser fibres are generally intermingled; these are commonly found to form the margins of one or more apertures, through which the absorbents escape into the abdominal cavity, after threading their way through the canal. This fascia presents a cupped or concave surface towards the abdominal cavity;* and is connected by some loose cellular tissue to the opposing peritoneal surface. An absorbent gland† is almost constantly found lying upon it, or imbedded in its tissue; and a few fat cells, generally seen towards the back part of the femoral ring, mark the situation of one or more of the openings through which the absorbent vessels pass.

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* "On the outer side of the duplicature—the fascia cribriformis of modern writers—we discover the vena saphena lying in a hollow or channel, which is covered only by the superficial thin layer of fascia, and which leads up to the crural foramen of Gimbernat, situated between the great vein and the crescentric fold at the

(18)—The lamina which occludes the *lower* outlet of the *femoral canal,* is firmly attached to its edges, and terminates in a funnel-shaped process, which is prolonged and eventually lost upon the last portion of the saphenous vein,—whence its name. Its line of union with the edges of the opening in the sheath is frequently so indistinct that its existence as a membranous layer, distinct from that with which it is connected, has not been generally admitted; on the other hand, from this circumstance, together with that of its cribriform nature, it has been rather regarded as "*a cribriform portion of the sheath*" (14). In the bodies of children, the parts as they have now been described can generally be most satisfactorily made out.

(19)—The proper contents of the crural canal are generally absorbent vessels and a few nervous fibrils, surrounded by fat and cellular tissue, which vary in quantity in different subjects.

(20)—The ordinary course of a femoral hernia is through the femoral ring into the crural canal, when it is termed "incomplete" (sub-sec. *d*); and from thence by the lower outlet of the canal into the femoral fossa (23), when it becomes more cognizable to the eye as well as to the touch, and is termed "complete."

(*a*)—The hernial tumour in descending first meets with an obstacle in the septum

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pubes; *and in femoral hernia, it is in this hollow, which may be called the vagina*—elsewhere the *vaginal sheath—of the saphenic vein, that the gut is lodged.*"—(Op. cit. Mr. Burn's on Hernia, 1806.)

* This fact appears to have been first noticed by Mr. Guthrie, who regarded the concavity as favouring the protrusion of a peritoneal pouch through the femoral ring. I fully concur in *this* view; but cannot think with that gentleman that the writings of Sir A. Cooper, by not sufficiently insisting upon this peculiarity of the septum crurale, conspire with those "of the French anatomists" (referring I presume to Breschet, certainly not to Cloquet) in producing the misapprehension, that a hernial tumour might easily escape the forming of an investment from this fascia, by passing down "by the side of, and in contact with, the (septum of the) femoral vein."—(Op. cit. p. 31. See note to sec. 20 *a.*)

† Gimbernat did not overlook the fact of the frequent occurrence of this gland, and regarded it as an obstruction to the descent of a femoral hernia; and further says, that the rupture occasionally descends behind it.

crurale (17) and its contiguous cellular tissue; and if it should not evade the former by slipping through one of its foramina, (an occasional exception to the rule,) the sac pushes the extensile tissue of this fascia before it, and in this manner forms its first hernial covering. In its further course, this covering gets an accession to its outer surface from the fatty and cellular contents of the canal; and on the hernia becoming "complete," also from the yielding "vaginal sheath" of the saphenous vein (18), or from that lamina and the portion of the sheath adjoining its upper border, which occasionally yield together as portions of one and the same tissue. These coalesce, and together form that investment,—first pointed out by Sir Astley Cooper, and by him designated—the "*Fascia Propria.*" *

(*b*)—This fascia is of various degrees of density, † and generally to be distinguished by some fatty matter, and occasionally a gland which can be seen amidst its heterogeneous texture through the more filmy expansion which completes its outer surface (17.) It is attached to the margins of the femoral ring, as well as to those of the lymphatic division of the lower orifice of the sheath.

(*c*)—The fascia propria is not usually so firmly attached to the opposing surface of the hernial sac on the one side, or to that of the cribriform fascia or other covering, on the other, but that it can be very readily separated. I have, however, seen its *outer* surface so firmly adherent to the fascia cribriformis, that the two coverings could hardly be distinguished. It is not uncommon to find fluid between it and the hernial sac, (see note to sub-sec. *b*,) a presumed secretion of the former layer; and this should not be forgotten in operations which require the successive division of these layers, or on the escape of such fluid, the operator might fancy that he had opened the sac itself. Large masses of fat are sometimes found, generally in connection with the inner surface of this structure;* and serous cysts,† even hydatids,‡ fibrous and other tumours,§ occasionally develope themselves in its tissue. From long continued strangulation, it often becomes densely injected with blood, and therefore of a dull red colour.

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* Sir A. Cooper's account of this fascia is as follows:—"A thin fascia naturally covers the opening through which the hernia passes, and descends on the posterior part of the pubis. When the hernia therefore enters the sheath, it pushes this fascia before it. . . . The fascia which forms the crural sheath, and in which are placed the hole or holes for the absorbent vessels, is next protruded forward, and is united with the other, so that the two become thus consolidated into one. . . . It may be termed the fascia propria of crural hernia." (Op. cit. p. 4. Part II.) Mr. Key well remarks upon the surgical importance of this layer, that "the mistake of returning a hernial sac unopened now rarely occurs, since our author has so particularly directed the attention of surgeons to the additional covering afforded by the fascia propria."—(Op. cit. 2nd edit. p. 11. Part II.) Some anatomists are disposed to consider this fascia as consisting of "all the dilateable parts interposed between the hernial sac and the superficial fascia."—(See a Paper by Mr. Todd, in Dublin Hospital Reports, vol. i. p. 248.) If the cribriform layer were more frequently *inseparably* than *simply* united to the fascia propria, this view of its composition might be correct; but the reverse is the rule with regard to these structures.

† "In small hernial tumours," says Sir A. Cooper, "this bag is thicker than the sac itself; but by being gradually extended, it becomes thinner and less distinct." (Op. cit. p. 2.) Mr. Guthrie, on the other hand, contends that as this fascia is prolonged, it becomes "thickened and increases by a regular growth; its outer surface being rough and adherent to the surrounding parts, the inner being a secreting surface."—(Op. cit. p. 32. See Medical Gazette, vol. xxxii. p. 209.)

(*d*)—Should the hernial sac force its way *through* an opening in the *septum crurale*, it is evident, that whilst in the crural canal, it would have an investment only from the loose cellular substance which separated that fascia from the peritoneum; and on the hernia becoming *complete*, that investment, even with the addition of the *vaginal sheath* of the saphenous vein, would still be so thin and incompetent as hardly to deserve the name of a fascia; consequently, such a hernial tumour might be said to be wanting its *fascia propria.*‖ The neck of a hernial tumour thus formed might be constricted even to strangulation, by the fibres which border the orifice through which it escapes, should they happen to be more than usually strong. An *incomplete* hernia, so strangulated, would in all probability be small and not present the least outward indications of its existence: should the symptoms of such an affection manifest themselves, unaccompanied by its usual external evidences, it would be well to consider the possibility of such an occurrence, as a mode of explaining the apparent anomaly.¶

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* "I lately dissected a femoral hernia," says Mr. Key, "that was found in a subject brought into our dissecting-room, in which the fatty structure between the hernial sac and the fascia propria bore a striking resemblance to omentum."—(Op. cit. Part II. p. 11.)

† See Cases with Dissections, recorded in Lancet, 1827-8, p. 574: by Mr. Macilwain; also in Medical Gazette, vol. xx. p. 14.

‡ See Medical Gazette, vol. xx. p. 118.

§ See Surgical Observations, p. 300; Parisian Journal, tom. i. p. 252-3; Monro, on Crural Hernia, p. 80; and Mr. Lawrence, Op. cit. 5th edit. p. 498.

‖ This, I conceive to be, the explanation of a fact observed by Mr. Vincent, Mr. Guthrie, and others; viz., the occasional absence of the fascia propria from amongst the ordinary coverings of a hernial tumour.

¶ In the dead-house of the Royal Free Hospital, whilst examining the parts of femoral hernia, I accidentally discovered an instance of a hernial sac, incarcerated in the manner referred to in the text. It had not a fascia propria, and was girthed tightly at its neck by the margin of the opening in the septum crurale, through which it had just descended into the crural canal. Had a knuckle of intestine been forced into this sac, it would undoubtedly have suffered strangulation.

The size of the sac, in cases of incomplete femoral hernia, is usually so small that they are most frequently unaccompanied by an external swelling; and numerous cases are recorded, in which the fatal mistake has been made, of referring the symptoms of strangulation under such circumstances, to other, and less serious affections of the alimentary canal. Verheyen says, after the details of a case which terminated fatally, "Eundem casum invenio quoque observatum à Cl. D. Nuck; et, quod mireris, in utroque casu nihil exterius fuit observatum, quod referret herniæ speciem," &c., &c.—(Tract 2, cap. vii. Anatomia Corporis Humani, 1693.)

(21)—The hernial *sac* is formed from that portion of the peritoneum which lines the hollow of the abdominal surface of the septum crurale, or by a gradual extension of its tissue, in obedience to the pressure exerted upon it.

(*a*)—Its extensibility is very great, so that scarcely any reasonable limits can be assigned to the size which it may not under favouring circumstances attain;* but in femoral rupture, the disposition in the protruding mass to become bulky, is checked by the restraint imposed upon it by the anatomical arrangements and other peculiarities of that part of the thigh which it commonly invades. Inasmuch, however, as a femoral is comparatively smaller than an inguinal rupture, it is more dangerous.† The sac has been usually considered as consisting of *a neck* and *fundus;* terms which require no further definition here.

(*b*)—The hernial sac has been known to take several different courses on protruding from the abdominal cavity, according to the direction of, and other circumstances affecting, the forces which impel it on the one hand, and the comparative powers of resistance, which the fascia guarding the femoral ring, and those penetrable or extensile tissues that protect other outlets in its neighbourhood, oppose to it on the other. It has been known to pass beneath the crural arch, the iliac fascia lata, and the internal circumflexa ilii artery, into the space between the anterior superior spinous process of the ilium and the femoral vessels;‡ or into the space on the outer side of the femoral

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For analogous cases, see Surgical Observations, by Sir Charles Bell, Part II. p. 181; Noveaux Elements de Médicine Opèratoire, par Velpeau, tom. ii. p. 330; and Case in Medical Observations and Inquiries, by Mr. Else.

* A femoral hernia has been known to occupy "the whole of the hollow from the anterior superior spinous process of the ilium to the tuberosity of the pubis;" and in another case quoted by Sir A. Cooper, it was known to extend half-way down the thigh.—(Op. cit. Part II. p. 1.) Other cases where the tumour has attained even a still larger bulk have been recorded.

† Sir A. Cooper.—(Op. cit. Part II. p. 1.)

‡ The *external* form of crural hernia of Hesselbach. In this case the tumour was not only covered by the crural arch, the iliac fascia lata, and partly by the sartorius muscle, but it appears to have insinuated itself somehow behind the fascia iliaca. The mouth of the sac was its widest part.

The triangular space between the iliac angle of the sheath and that of the femoral opening (sec. 23 *b*) is sometimes so capacious, and the lamellar expansion of the wall of the sheath over it, as it loses itself on the fascia iliaca, so thin and yielding, that I am persuaded a hernial sac might find its way into it. Mr. Macilwain, in his "Surgical Observations," p. 293, states, that "there are no less than six instances recorded of hernia occurring on the external side of the femoral artery," amongst the records of the London Truss Society, by Mr. Taunton. This variety can only happen, according to Mr. M.'s opinion, "from some imperfection in the structure of Poupart's ligament." Mr. Lawrence remarks upon this statement, that "as the situation at which the protrusion occurred, was not ascertained by examination after death in either of these six cases, it will remain doubtful whether they really presented examples of deviation from the ordinary situation of femoral hernia."—(Op. cit. 5th edit. p. 486.)

vessels, and close to them; or, even directly in front of them.* The sac has also been traced through a rent in the posterior wall of the sheath;† and I am apprehensive, from the description of a case of this kind annexed, that it must have insinuated itself into the triangular space behind the posterior, or deep, angle of the sheath (15 *b*), from between the fasciculi which strengthen that portion of its walls (15 *f*); for the direction and strength of those fasciculi, and the space which separates any two of them, are such, that on sufficient force being applied, the comparatively weak membranous tissue that intervenes, and is occasionally in its natural condition imperfect, would readily give way. Two sacs have been known to form, one of which passed into the sheath of the lymphatics, the other into the sheath of the vein.‡

(*c*)—With its usual investment, the *fascia propria*, the *sac* does not frequently form a very strong union; but still it becomes so firmly impacted by the surrounding structures, that it is not easily to be dislodged and returned into the abdominal cavity. This is more especially the case when the sac, or the greatest portion of it, is formed by an *extension* of the tissue of the original hernial *pouch;* and not by a *dragging down* of a further portion of the peritoneum. Hence, should the surgeon entertain the idea of returning the hernial sac, after emptying it of its contents, the inquiry should be first made, to which of these two processes it is most likely that the production of the sac is due. If to the *former*, any attempt to dislodge it would be inconsistent, since the pouch would in no way appertain to the abdominal cavity; but if to the *latter*, its restoration might be justifiable. The circumstances of its formation and development, together with the space of time that might have elapsed between the period of its original descent and that at which the attention of the surgeon is directed to it, would afford material, if not positive evidence of the *kind* of hernial sac which a given rupture might possess. Thus in a suddenly-formed and small hernia, the sac would be *peritoneal*, and *belong* to the abdominal cavity; and if the means are effectively used to prevent its increase in size, it would still remain so; but if its formation be slow, and its increase in bulk be due to the want of proper precautions, the sac, in all probability, will be *a new structure,* and have no relation to the abdomen, but that of continuity with its peritoneal lining.

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* Such cases are recorded by Mr. Lawrence from dissections made by Mr. Stanley. In one of the two instances narrated "the epigastric artery arose from the femoral and gave origin to the obturatrix. The common trunk, and its division into the epigastric and obturatrix branches were placed in front of the sac."—(Op. cit. p. 486.)

† "J'ai vu le sac s'engager par une ouverture de la paroi postérieure du canal crural. Il reposé immédiatement sur le muscle pectine, et avait au-devant de lui l'artére et la veine fémorale, dont il était séparé par le feuillet profond de l'aponeurose fascia lata."—(Cloquet, Recherches sur les Hernies, Prop. 46, p. 85.)

‡ "Observations on the Unusual Origin and Distribution of Large Arteries," by Mr. A. Burns, 1809.

(*d*)—The external adhesions of the sac depend much upon the amount of pressure to which it has been subjected; and hence, not only from the constraint of the crural arches, but from the action of mechanical contrivances applied for the purpose of preventing intestinal or other protrusions, they most frequently occur in the region of *its neck;* and it not unfrequently happens in consequence of the effusion of organizable lymph among those tissues by which that portion of the sac is immediately surrounded, that they become matted together with it into one dense and rigid mass.

The sac and its immediate covering occasionally become closely adherent to each other, and sometimes even partially consolidated; but this consolidation is more likely to occur in that variety of rupture in which the fascia propria is wanting; for it would appear that these structures are not prone to effect a powerful adhesion of their surfaces.*

(*e*)—The tissue of the sac is liable to become in all or any of its parts the seat of either of those morbid changes which are common to serous membranes; but it must be premised that the condition of one part of a diseased sac can afford no indication of the state of any other, or even of an adjoining portion; thus, *the fundus* might be normally translucent and ductile, and yet *the neck* be at the same time thickened, and its orifice permanently contracted.†

Of these changes a variety commonly met with, is thickening by interstitial deposition and opacity, attended with rigidity; and as it is generally the result of pressure, the neck is most commonly affected, although the whole of the sac has been found thickened in an equal degree.‡

(*f*)—In the pathology of ruptures, the thickening which the sac undergoes at its

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* Mr. Luke says, "The firmness of the adhesions of the parts in which the sac is imbedded bears no proportion to the duration of the hernial protrusion, as might *à priori* be expected; for in all the cases (five) related, the hernia had been of some years continuance, yet in each the sac was reduced without the employment of much force."—(Medico-Chi. Trans. vol. xxvi.)

† The reader is referred to some very interesting illustrations of this part of the text by Sir Charles Bell, in the twelfth volume of the Lancet, p. 548; and in his Institutes of Surgery, vol. ii. p. 22.

‡ A case is recorded in the Lancet, 1838-9, in which the sac, on account of its excessive density, was entirely removed. According to Le Dran, this thickening is in proportion to the length of time the hernia has existed (see "Observations," p. 206); and in later times Mr. Howship has made the same remark, referring the change to an effort of nature, by which additional support is given to its pendulous contents.

In the dissections of Le Dran, the necks of those hernial sacs which were thickened, were found most constantly in persons who had worn trusses; and from the rudeness of the apparatus at that period in vogue, and the comparative frequency with which the neck of the sac was discovered to have undergone this change, neck and orifice, is one of the most important subjects, and has been most ably investigated and described by M. Jules Cloquet, in his "Recherches sur les Causes et l'Anatomie des Hernies Abdominales," 4to, Paris, 1819, portions of which I shall transcribe from the translation of Mr. Lawrence.* " 'The thickness of the neck of the sac varies much. In small ones of a conical figure the peritoneum retains its natural structure at this part, simply turning over, and lining the aponeurotic ring. This is the least frequent case; more commonly, in passing through this narrow aperture, it is folded, puckered, or contracted, and gains in thickness what it loses in extent of surface. . . . These folds are the rudiments of those which form when the mouth of the sac gradually contracts; it ultimately disappears, giving origin to radiated marks, disposed like the rays of a star, and indicating the places of their former existence. . . Sometimes the neck of the sac presents a rounded, whitish, almost fibrous, and very firm ring, either of uniform or varying thickness, in different points of its circumference.' " Mr. Lawrence adds, "In many herniæ, the orifice of the sac presents a combination of the preceding characters (referring to others not enumerated in the extract.) Thus it may be fibrous, thick, and rounded, in one part; thin, and like a valvular fold in another; hard, callous, and folded, in one place; uniform and natural in other parts." A ring thus formed can of itself incarcerate and strangulate any portion of the abdominal or other contents that may be forced into it; and should the connections of the sac to the surrounding textures be slight, and the contents be adherent to its inner surface, a moderate amount of force applied in the way of taxis, prior or even subsequent to operation, might return the whole, unrelieved, into the abdomen. This has been termed "reduction en bloc," or "en masse," by which procedure the patient is placed in a position more replete with danger than before.† This

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the observation of Le Dran is not only likely to be strictly accurate, but there is much reason to apprehend that herein lay the objection which presented itself, and that successfully, to the full adoption of Petit's operation at that period. By a parity of reasoning, it might also be inferred, that the revival of the operation in our day by Messrs. Key, Luke, and others, has been favoured by the previous use, in most instances of more suitable trusses, and consequently the comparatively infrequent occurrence of strangulation by the neck of the sac.

It is on this account of the utmost importance that the trusses presented by our Truss Societies to the poor should be well constructed and applied with much care in every case.

* Op. cit. 5th edit. p. 26. Sir Charles Bell had previously described these changes, but not at so great a length.—(Op. cit. vol. ii. p. 23.)

† This accident and its causes were well known to the earlier surgeons. Le Dran was consulted, in the year 1726, in a case in which the younger Arnaud supposed he had accomplished the liberation of a strangulated femoral rupture, without relief to the symptoms. The case terminated fatally; and Le Dran foretold what, from dissection, was subsequently proved to have been the cause of the disaster. "We found," says Le Dran, "the cystis hernialis in the abdomen, . . . and within the cystis was inclosed half an ell of the intestinum

thickening of the neck of the sac is not so frequent in femoral as in other forms of rupture.*

"When the hernia passes through a canal, the openings of which are narrower than the middle, the sac may become contracted at each orifice, and thus present two thickened rings. A constriction, more or less sensible externally, generally denotes the situation of those thickened rings which have descended with the sac. They vary in number, position, and structure, and produce the septa and valvular folds met with in hernial sacs.† The several divisions of a sac having many rings may be considered

jejunum. Embracing the whole cystis with my hand, I endeavoured to draw out the intestine, . . . but the entrance into the cystis was so contracted that it was impossible; and I could effect it in no other way than by the dilating of the orifice with my scissors."—(Observations, p. 196.)

Mr. Sharpe remarks, "It is now universally acknowledged, since the first hint was given about twenty-five years ago, that the entrance to the herniary sac is capable of so great a constriction as to compress the intestine and excite the same symptoms with stricture at the rings. There are examples where the hernia has been reduced into the abdomen, and notwithstanding the reduction, all the complaints have continued as before." Here follow some sensible remarks on the means of knowing when so untoward an event has taken place, amongst which I would refer particularly to the "hardness of the tumour," which "is sensible to the finger when it is introduced through the passage by which the hernia was formed," and the absence of the noise or gurgling which usually accompanies the *liberation* of the constricted intestine.—(A Critical Enquiry, &c., &c. London, 1740, p. 32.) In reference to the *noise* which Mr. Sharpe regarded as evidence of the liberation of a strangulated portion of intestine, it may be observed, *en passant,* that as a sure indication it is not always to be relied upon. Dr. Breschet, in his "Considérations sur la Hernie Femorale," (Op. cit. p. 101, et seq.) relates an interesting case from the practice of M. Dupuytren, in which a man was brought to the Hôtel Dieu on the fourth day of a strangulated femoral hernia. "Dans la journée, la tumeur rentra tout-à-coup et *avec bruit*; le soir on fit une saignée de deux palettes; on donna des lavements." The symptoms of strangulation, however, did not subside; but, on the contrary, increased. On the twelfth day, M. Dupuytren laid open the orifice of the crural canal by a vertical incision, and on introducing his finger, felt behind the ring a round elastic body, to which the patient referred as the seat of his pain; this he drew down, by means of the cellular substance on its exterior surface, assisted by the patient's coughing, below the crural arch, when it presented the appearance of a grayish white swelling, with an uneven surface. When the cyst was punctured, some bloody fluid squirted through the orifice, and on the opening being enlarged, a portion of intestine of a reddish-brown colour was discovered, strangulated by the contracted portion of its fibrous envelope. The operator divided the stricture, the intestinal convolution was liberated, and the patient recovered.

Scarpa, Sabatier, Luke, and Lawrence, have each remarked upon such cases.

In a case by Sabatier, recorded in his "Medicine Operatoire," ed. 2, tome ii. p. 342, after such an occurrence, the patient was made to get up and forcibly blow his nose. The rupture (which, according to Scarpa and Lawrence, is usually situated behind the ring and between the parietes of the abdomen and its peritoneal lining) re-appeared, and was then drawn down through the ring sufficiently low to enable the operator successfully to divide the seat of stricture, and to relieve the strangulated parts.

* See an excellent Paper, by Mr. Luke, in 28th vol. of Med. Chi. Trans.; also Leçons Orales de Clinique Chirurgicale, by M. Dupuytren, tom. i. p. 275, in which a remark is made to the same effect.

† The occasional existence of a series of distinct constrictions in a hernial sac was early noticed by Arnaud, who alleged that either one might cause strangulation of its contents. London, 1748. (Op. cit. p. 355, et seq.); and their formation was afterwards explained by Sir Chas. Bell in his "Institutes," vol. ii. p. 23.

as distinct protrusions, descending successively at different periods. . . . The thickened neck, when pushed beyond the aponeurotic opening, must experience distension and compression from the organs contained in the rupture, or from surrounding parts. Thus its two component laminæ may be separated, and assist in the enlargement of the sac, the contraction being effaced entirely, or in part. A trace of it remains in the shape of a white fibrous line, slightly prominent. This decomposition of the thickened ring is far from being a constant occurrence. Sometimes the contraction increases; it embraces closely the protruded parts; it may become adherent to them, or may even be the cause of strangulation." *

(*g*)—A constricted and thickened portion of a hernial sac might take on an action by which, should it be unoccupied for a period sufficiently long, its walls will ultimately become consolidated; and consequently the fundus will remain in the hollow of the thigh as a cystic tumour, having no connection with the peritoneum, but through the medium of a ligamentous cord, which only remains of the original channel of communication. By the contraction of the obliterated portion of the sac, a space is left between it and the margins of the ring, sufficiently patent to permit of another hernial protrusion taking place by its side. †

(*h*)—The tissue of the sac is liable to become the seat of various deposits, such as cartilage, bone, and a peculiar brown or blackish substance, ‡ which has been seen in the form of patches of different sizes; also of malignant growths and ulcerations.

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* Jules Cloquet, (Op. cit. p. 46—54,) from Lawrence on Ruptures.

† This kind of change in portions of the hernial sac was made the subject of able investigation by Cloquet. Mr. Lawrence says, that "two or three sacs may pass through the same ring, by the side of each other, either communicating together or otherwise." And that "most of the serous cysts found not unfrequently round hernial tumours, and sometimes causing doubt or embarrassment in the operation, are ancient sacs, obliterated at the neck, and adhering to the swelling."—(Op. cit. p. 30.) According to M. Cloquet, these "false sacs" are much more frequent in external inguinal, than in other ruptures; then come the internal inguinal and crural.

Meddling with such tumours is not unattended with danger, from its proneness to give rise to serous peritonitis. In a case which presented itself at the Royal Free Hospital, at the earnest solicitation of the patient, whose sufferings on account of it kept her from her usual occupation, I was induced to attempt the removal of such a cyst; but the sensitiveness of the cord by which it was connected with the peritoneum was so great, and other circumstances attending the effort so forbidding, that, after exposing the parts to view, I desisted from my purpose. A severe attack of peritonitis followed, which it required prompt and strong means to allay.

‡ M. Cloquet, I believe, drew the attention of surgeons first to this form of change or deposit in hernial sacs. "I calculate that these black spots are found in ruptures once in fifteen or twenty times. I have seen them in inguinal herniæ of both kinds, in crural, and even in the remains of the tunica vaginalis. I have not met with them in other ruptures, but have seen them sometimes on the intestines and abdominal parietes.

(*i*)—Visceral protrusions are sometimes met with not enveloped by peritoneal sacs. It is obvious that those portions of the abdominal or pelvic contents,—as of the cœcum rectum or bladder,—which are *behind*, and therefore devoid of a covering from the peritoneum, might reach the femoral ring by a course between that membrane and the walls of the femoral sheath, and in this manner become herniated without providing for themselves peritoneal sacs. Instances have been related in which the portion of peritoneum which would otherwise have yielded a sac, has been ruptured, either by a blow or in consequence of some sudden and violent muscular exertion, and thus a hernial tumour has, in this respect, been deficient.*

(*j*)—In this treatise I shall not do more than make a passing allusion to the adhesions which frequently occur to connect not only the contents of a hernial sac to each other, but firmly to its inner surface. These are found to exist most abundantly and frequently around the neck of the sac; and together with those which may simultaneously exist between its outer surface and the contiguous portions of the fascia propria and femoral ring, constitute the means by which the visceral contents might become most firmly and seriously incarcerated; and, without actually strangulating them,

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I have sometimes seen a similar black matter deposited in the texture of adventitious membranes developed on the internal surface of the sac: these membranes may be detached in pieces, which have some resemblance to portions of the choroid membrane."—(Op. cit. p. 152.)

"Sometimes we find," says Mr. Lawrence, "on the internal surface of the sac, red patches, like ecchymoses, formed by the decomposition of blood or of some red fluid, in the texture of the peritoneum. Beside these black and red marks, others are seen of intermediate colours; dark red, or brown; and these several varieties may occur in one and the same sac. Probably these various tints are only degrees of one alteration, the brown spots having been first red, and then subsequently becoming black." Mr. L. ascribes them to effusion of blood, "and to the various changes it may subsequently undergo."—(Op. cit. p. 39.)

* Garengeot has given a case of a young woman, in whom a sudden and violent effort produced a crural rupture. In operating, the protruded parts were found to consist entirely of mentum, not enveloped by a sac. —("Opérations," tom. i. p. 373.) Haller says, "Vel cum aliqua, vel absque ullo peritonæi involucro contingit hernia, prout rumpitur illud, vel in quo prodit in hoc loco naturaliter deficit."—(Disputationes, tom. v. p. 626, Lausannæ, 1756.)

Mr. Lawrence goes far towards condemning Garengeot's case as "fabulous;" and after alluding to the origin of the term *rupture*, viz., to a supposition prevalent amongst the ancients, that such protrusions most frequently took place in consequence of a laceration of the peritoneum, goes on to say, that "Experience has shown this distinction" (between the class of cases referred to, and that in which the protrusion is accompanied by a yielding and dilatation of the peritoneum) "to be unfounded; and has proved that ruptures of both kinds"—*i. e.* those produced suddenly, on the one hand, and progressively, on the other—"have sacs; a conclusion, which correct anatomical views would certainly have suggested."—(Op. cit. p. 9.)

Mr. Cock details a case in Guy's Hospital Reports, vol. v., in which the intestine passed through a rent in the sac, produced in all probability "by the man's own forcible and unscientific attempts to return the intestine after it had resisted the ordinary means he had been in the habit of employing."

they produce symptoms equally severe and formidable, by interrupting the peristaltic action of the contained intestine.*

(22)—I come now to the description of the hollow in the front and inner side of the thigh, to which allusion has been repeatedly made under the name of the *Femoral Fossa.*

(*a*)—If the integuments and superficial fascia be carefully removed, and the upper arches of the saphenous border be turned back, so as to expose that portion of this space which is situated immediately below the crural arch, and the cellular and other tissues which occupy it be then cleared away, its lateral *boundaries* will be distinctly seen. Above, they are formed by rather less than the inner *third* of the crural arch, a section of the cord or round ligament, and the ligament of Gimbernat; on the outer side, by the cribriform fascia (14); on the inner, by the pubic edge of the thigh; and below, by the terminal portion of the saphenous vein. The depth of the fossa below the skin, in consequence of the rapidly receding front surface of the pectineus muscle, increases from the inner edge of the thigh, where the fascial covering of that muscle is in contact with the superficial fascia, to that point at which these are separated from each other by the cribriform fascia and adjoining side of the femoral sheath, as may be seen from a transverse section of the thigh made immediately below the crural arch.

(*b*)—According to the size of a complete hernial protrusion, so a greater or less portion of the *femoral fossa* will become occupied by it. It is obvious that, with occasional and rare exceptions (14 *e*), in taking possession of this fossa the tumour does not get to the inner or pubic side of its outer wall, or that formed by the fascia cribriformis, but pushes this fascia before it, remaining on its outer side; so that although the *femoral fossa* is encroached upon by the tumour, its boundaries, as far as the parts composing them are concerned, remain the same. The cribriform fascia cannot strictly be said to form one of the *investments* of a *small* hernial tumour, since it would merely be displaced by it, and be applied against a comparatively small portion only of its exterior surface.

(*c*)—By referring to plate 1, and remembering the relation of the terminal portion of the falciform process of the fascia lata (pl. 2, *g*) to the femoral ring,—that it determines its pubic boundary,—it will be clear that the neck of the hernial tumour cannot bulge in the direction of the tuberosity of the pubis, beyond a slightly curved line, drawn from the point where the falciform process decussates with the crural arch, directly backwards to the ileo-pectineal ridge; so that although the fundus of the tumour be so large as to occupy a very considerable portion of the *lower part* of the femoral fossa, the restraint which has just been referred to as placed upon its neck, and that which the portion of the tumour next below suffers from the walls of the *canal*, will effectually prevent the hernial mass from occupying more than the outer half of the fossa *at its upper part.* The first, or smallest portion of the fundus of the tumour, will lie below the falciform edge, and its outer side will be thrown against the external or semilunar edge of the saphenous border; but no portion of its inner wall will come into contact with the edge of that process of fascia which has been described as completing its upper arch on the pubic side (11 *d*, pl. 3, fig. 2 *b*); on the contrary, this edge, and the side of the hernial tumour opposite to it, will be separated by a space, slightly different in width, according to the sex and natural or acquired capacity of the *ring*, but always considerable, and sufficient to admit of the first steps of operative proceedings for the liberation of a hernia strangulated by parts external to the sac.

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* Mr. Howship records instances in which the sac and its contents were so closely adherent as to preclude the possibility of any fluid being deposited in the sac.—(Op. cit. p. 308.)

For details of the pathological relations between the sac and its contents, I would refer the reader to the excellent works of Breschet, Cloquet, and Lawrence; and for an account of that form of hernia, to which the last paragraph of this section especially refers, to the interesting work of Mr. Stephens on "Obstructed Herniæ."

The boundaries of this space then, as they will be required to be borne in mind for the practice of the operation which will hereafter be described, are;—*above*, the pubic portion of the crural arch (pl. 1, *f*), and the cord or round ligament, immediately on its escape from the inguinal ring (pl. 1, *g*); on the *inner* side, the edge of the thigh; and on the *outer* side, the pubic wall of the hernial tumour covered by the cribriform fascia (pl. 1, *i*); whilst its *base* is formed by the pectineal fascia, represented in the same plate by the upper letter *b*. It will be noticed, that the edge of the inner and upper half arch of the saphenous opening is not referred to as one of the boundaries of the space just described; and for this reason, that the boundaries given are distinguishable externally prior to operation, and are sufficiently precise to serve as a guide to the fossa and parts beneath; whilst the structure referred to can only be felt after the finger has passed the incision through the integuments and superficial fascia; and then its edge is generally so strong as to become a guide in the proceeding which is to complete the operation.

(*d*)—In proportion to the bulk of a hernial tumour,—it being usually globular in shape, or nearly so,—the *width* of the unoccupied portion of the *femoral fossa* will be lessened; but its *depth*, against the side of the tumour, will be increased by the raising of the superficial fascia and integuments above the level of the surrounding skin, nearly to that extent by which the longest diameter of its fundus exceeds the natural depth of the part of the fossa in which it is lodged. This is the space into which I propose that the first incision for the relief of a strangulated femoral rupture shall be carried.

(*e*)—Occasionally the hernial tumour tilts upwards, towards, and even upon, the crural arch, instead of finding its way down the thigh. This disposition of a hernia is said to be of frequent occurrence; but the generally small size of a crural hernia, and the adhesions of the superficial fascia to the crural arch, would, at first, oppose its taking such a course.

(23)—The *cord*, and *round ligament*, in their transit from the abdominal cavity, to their respective destinations, first cross the band of transverse fibres in the front wall of the sheath (15 *g*); and after a short course on the floor of the inguinal canal, where they are skirted behind by a section of Hey's ligament, they pass successively over the outer and front angle of Gimbernat's ligament, the inferior pillar of the external abdominal ring, and the upper and inner corner of the femoral fossa, parallel to, and generally about the distance of a line or two from the edge of the adjoining portion of the saphenous border (11 *d*, pl. 3, fig. 2 *b*).

(24)—The *epigastric artery* traverses the fascia transversalis, on the outer side of the femoral ring, at least half an inch from the neck of a hernial tumour, when taking its usual course. It therefore can only be injured by a very "free" incision in the direction, recommended by a very high authority, forwards and outwards.*

(*a*)—The *obturator*, when it takes its normal course, is also safe from harm in the operations for femoral rupture; but from the frequency with which it deviates, and the directions, which, on such occasions, it takes, it is of consequence in an operation, that the stricture should be divided in that direction which is least likely under any circumstances to injure this erratic vessel.

(*b*)—According to Professor Quain, the obturator in 361 cases examined, arose as follows:

" In two instances out of three, from the internal iliac.

In one case in three and a half, from the epigastric.

In a very small number of cases (about one in seventy-two) by two roots from both the above-named vessels; and in about the same proportion, from the external iliac artery." When arising from the epigastric, as is frequently the case, according to Mr. Harrison, "it turns in a tortuous manner inwards and downwards, crossing the crural or femoral ring, sometimes along its *anterior*, sometimes along its *posterior* border; . . . When it "passes along the anterior border, and then descends along its internal side, it may be considered as bounding three-fourths of the circumference of this opening." *

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* M. Dupuytren.

As this vessel pursues its course in connection with the fascia transversalis, and as this lamina is below the plane of that which contains Hey's ligament, it is obvious that by *cautiously* incising the seat of stricture, supposing it to be formed by that band, as is most commonly the case, the obturator may escape being wounded.

In two subjects, the obturator was found, by Mr. Burns, to arise from the femoral, at the distance of two inches below Poupart's ligament. "It mounted along the pectineal aponeurosis on the pubic side of the vein, and entered the pelvis by the crural hole with the lymphatics. In this variety, the artery would have been placed on the *posterior* part of the sac in crural hernia." † In another subject, in which, of two sacs, one entered the sheath of the lymphatics, the other the sheath of the vein, the obturator and epigastric arteries came off by a short trunk from the external iliac; and the obturator, in its way to the thyroid foramen, encircled the neck of the sac contained in the venous sheath. . . . "Had strangulation taken place in this person in the pubal tumour, we might have operated with great ease and safety in Gimbernat's mode; had the iliac tumour, however, become incarcerated, and had we attempted in this case to cut inwards towards the pubis, we might, without doubt, have divided the obturator artery. If, however, the obturator artery and the epigastric continue connected for a considerable distance from their origin, and if one herniary tumour pass in the sheath of the vein, and another into the common sheath of the lymphatics, then both sacs may be traversed on their upper margins by the obturator artery, and the tumour in the lymphatic sheath will likewise have the same vessel on its pubal side." ‡

In the dissecting-room of St. Thomas's Hospital, Mr. Dixon met with a still more strange, and, in relation to femoral hernia, more serious variety in the mode of origin and distribution of these vessels. "A common trunk from the external iliac gave off three branches, an upper one taking the course of the epigastric artery upwards and inwards, and two below, the hinder and smaller of which descended behind the pubic bone, taking the usual course of the obturator when arising from the epigastric, whilst the front and larger one passed downwards and forwards behind the inner part of the crural arch, and dipped down before the pubic bone to the external obturator muscle;

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* "Surgical Anatomy of the Arteries," by Robert Harrison, M.D., 2nd edition, 1829, Dublin.

† Op. cit. by Mr. A. Burns.

‡ Op. cit. p. 314.

so that in this case did a femoral rupture exist, not only would its neck be surrounded on the inside by the hinder obturator artery, but its front would be crossed by the front obturator." [*]

Another variety is that in which an anastamosing branch, connecting the obturator and epigastric arteries, has been observed to traverse the inner edge of the femoral ring. [†]

(*c*)—Hence there is no part of the neck of a femoral rupture which might not by an irregular distribution of some one or more of the arterial branches in its vicinity, become closely skirted by a large and important vessel; so that although such instances are comparatively rare, in order to avoid the dangers which would accrue from the division of such a vessel, it is always expedient, in whatever direction the ring be cut, to carry the incision no deeper than is necessary to permit of a facile return of the rupture. [‡]

(25)—The following measurements from Sir A. Cooper's work, will conclude this division of my undertaking:

MALE.

	Inches.
From the symphysis pubis to the centre of the orifice of the sac . .	2
From the centre of the orifice of the sac to the external iliac artery .	1
From the centre of the orifice of the sac to the centre of the external iliac vein	0$\frac{3}{4}$ths.
From the centre of the orifice of the sac to the origin of the epigastric artery	0$\frac{3}{4}$ths.
From the centre of the orifice of the sac to the inner edge of the internal abdominal ring	1
From the tuberosity of the pubes to the centre of the orifice of the crural hernia	1

FEMALE.

Each measurement is from one-eighth to one-fourth of an inch more where the female pelvis is large and well formed, than in the male.

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[*] Clinical Lecture by Mr. South, in Medical Times for September 12, 1846.

[†] See Preparation No. 1347, in College Museum.

[‡] Mr. Holmes Coote details a case of hernia in the 1st vol. of the Lancet for 1846, which occurred at St. Bartholomew's Hospital, in which the obturator wound around the upper and inner margin of the ring; but was uninjured by the operation. The stricture was divided by two slight incisions, one forwards, the other inwards.

(26)—A complete femoral rupture consists, in the protrusion into the thigh, of some portion of the abdominal or pelvic contents; and its strangulation, in the constriction of these parts by one or more of the structures that form the canal through which they pass, in such a manner, that, if unrelieved, the tissue situated beyond the seat of stricture would inevitably perish.

The protrusion itself, in the majority of instances, is formed by a visceral nucleus which becomes *completely* invested by a peritoneal sac (21), and fascia propria (20 *a*); and *incompletely*, by the fascia cribriformis (14 *d*). The anatomy of the parts, in their natural state, can, as we have seen, render a satisfactory account of the sources whence these coverings are derived; and by cautious dissection, each, in its order, may be as satisfactorily displayed in an old hernial tumour. But the ever-varying density and other physical qualities of these layers, either singly or in the aggregate;—the want of uniformity in the number and disposition of the ganglia appertaining to them;—the frequent developement in their tissues of abnormal growths;—the occurrence of diseased processes and deposits;—and the limited facility which the small wound of a well-performed operation affords for making out the distinctive characters of each texture as the knife discloses it; — are circumstances which tend to lessen the amount of assistance which such knowledge might, by an inexperienced surgeon, be expected to afford him. Still its attainment is of the highest importance, and only the most censurable temerity would induce any one to attempt a hernial operation without it; for it affords the only means by which the various and unlooked-for conditions of a hernial tumour, in the course of an operation in which they are unfolded to view, can be understood and successfully met; and is the first of a series of steps towards the acquirement of practical excellence in herniotomy. The *practised eye* alone, however, can make such knowledge subserve the operator's confidence and the patient's safety.

(*a*)—The relations of a rupture to the crural canal would be as follows:—Its neck would be situated within the femoral ring (16 *d*); the *upper* part of its fundus, within the canal itself; that portion which may have passed beyond its *lower* boundary or *orifice* would be lodged in the femoral fossa (22); whilst the whole would be covered by the superficial fascia and integuments.

(*b*)—In order to determine with precision what are those several structures, described as belonging to or immediately surrounding the crural canal, which, under certain circumstances, can incarcerate a hernial protrusion, it is necessary first to distinguish those peculiarities in their disposition and physical qualities which impart to these structures the power referred to. These peculiarities appear to be, 1st. That

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the canal is a narrow channel between comparatively large spaces; and 2nd. That the parietes and other boundaries of the channel, by virtue of their own textures or those immediately adjoining, have at different points unequal powers of resisting pressure from within.

It is a fact, as Mr. Wilkinson King aptly said, "much more remarkable than it has hitherto been thought," that "most herniæ exist for years before they become subject to a dangerous strangulation; that out of 100 cases, in 61 the mean duration of the hernia was about 20 years; whilst out of 98 cases, 94 were in various degrees 'old,' before they became strangulated." What, then, are those conditions of the parts concerned, which subject the hernial protrusion to the accident of strangulation?

It is obvious that whilst the hernial mass exerts no lateral pressure against the walls of the canal, the one would remain passive in regard to the other; but should the mass get an accession to its bulk, or swell, so as to exceed in size the ordinary capacity of its canal, that part of its wall, or other boundaries, would yield to the pressure which happens to be least able to resist it; whilst constriction would be effected by the resistant parts. By the construction and relations of the crural canal, its walls, with the exception of the front wall and pubic angle, are so fortified by their own or contiguous textures, that they are almost and equably unyielding: but the *excepted* portions are not so *uniformly* strengthened; hence upon the expansion of a hernial tumour beyond the ordinary limits of the canal, one portion would bulge, whilst another would be restrained or constricted by the tenser structures which belong to or encompass them.

Sir Charles Bell has enunciated nearly the same idea in the following passage:—"When the intestine is protruded into a narrow passage, there is nothing to prevent its being withdrawn on the next peristaltic convolution of the gut. It is when it escapes from the narrowness of the aperture that it swells up, and cannot be withdrawn. It is this escape from pressure which should chiefly attract your attention; it explains everything." *

(*c*)—It will now be clear why the structures, which will be enumerated, have the power, either singly or together, to strangulate a hernial tumour.

The *band of fibres* appertaining to the membranous walls of the sheath, which occasionally becomes concerned in constricting a hernial tumour at the ring (15 *g*).†

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* Institutes of Surgery, vol. ii. p. 24.

† In an excellent Paper by Mr. Luke, in the 28th vol. of Medical Gazette, p. 864, Mr. L. says, "In one case it (the seat of stricture) was *above* Poupart's ligament, produced by a transverse band of fascia crossing

The *crural ring*. Being constituted of elastic membranes, unless their tissues are thickened, or are firmly adherent to the hernial tumour, the ring can only act mediately upon the hernia.

The *femoral*, or *Hey's ligament* (12 *f*),* and *Gimbernat's ligament*, which surround and coerce the front and pubic side of the *ring*.

These ligaments are the most constant seats of stricture external to the neck of the sac. It is generally admitted that, as alleged by Sir A. Cooper, the contracting force which these several structures are capable of exerting upon a hernial protrusion, resides equally in every part of the ring or circle which they co-operate in forming. This view, however, is not in unison either with the results of experience derived from operations, or with the inferences to which a careful consideration of the disposition of the parts in question must lead. The femoral ligament exerts its force upon an impacted tumour in the direction from *before backwards*, and *this* force would inevitably be greater in amount than *that* which Gimbernat's ligament is capable of exerting in the *transverse* direction, since the *former* would meet with the antagonism of an unyielding body—the ramus of the pubis,—whilst the *latter* would only be opposed by the extensile tissues of the pubic septum of the sheath and the soft parts on its iliac side.

The *margins of the lower orifice of the crural canal* (16 *a* and 18), when unusually dense, will not only present a defined and sharp edge to the finger, but especially resist any attempts to stretch them ; and may, therefore, under such circumstances, assist in the strangulation of a hernial tumour.

The *edge* of the *falciform process* of the fascia lata (12 *c*).†

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the entrance of the funnel-shaped canal into which the hernia descends in its passage from the abdomen." In another case the stricture was seated " at least half an inch below the ligament ;" probably in the set of fibres described under the 4th head.

Whilst these sheets were in the printer's hands, Mr. Vallance, of Brighton, whose experience of herniotomy is considerable, in a conversation with myself, confirmed the opinion expressed in reference to this band and its occasional influence upon a strangulated femoral rupture ; see 15 *g*, and notes.

* Mr. Hey, Sir A. Cooper, Sir C. Bell, Messrs. Key, Lawrence, Luke, and other modern surgeons insist upon this as being the principal and most frequent cause of constriction in strangulated femoral rupture ; and it is a little curious that the first distinct recognition of this band of fibres removed from Mr. Hey's mind the impression, that when cutting this stricture, he was dividing Poupart's ligament.—(See Mr. Hey's Observations on Surgery, p. 156 ; also 12 *f*, and notes.)

† These fibres must constitute that seat of stricture to which Sir A. Cooper refers, as being situated " in the crural sheath and semilunar or lunated edge of the fascia lata ;" and which are divided by passing the knife " into the crural sheath at the anterior part of the sac," and cutting the sheath " as far as the *anterior* edge of the crural arch." But if after the division of the parts as here directed, the intestine, by slight com-

This edge probably would only become a seat of stricture in a few, and those extreme cases; and even then, would only be so in concert with other sources of constriction, or from some peculiarity in the direction assumed by the hernia itself. Thus should the septum on the pubic side of the sheath, as Mr. Guthrie has found it, be extremely dense, the crural ring and canal capacious, the protruded parts massive, and these on emerging from the lower orifice be tilted forcibly upwards, the edge referred to might assist in producing strangulation.

(27)—The hernial sac, in descending, might, as we have seen, pass into the crural canal through the septum crurale (20 *d*); and might also escape into the femoral fossa, through, and not behind, the cribriform fascia (14 *e*).

In these forms of femoral rupture, the margins of the absorbent apertures in these fasciæ respectively would constitute the seats of stricture.

The seat of stricture in *the septum crurale* demands attention for several reasons. The aperture is of itself generally so small, that a rupture through this channel would not be likely to become *complete* (20), hence the subjective symptoms of constriction might alone present themselves. Moreover the fact of constriction at this orifice can only be definitely ascertained after the parts which compose and surround the femoral ring have been freely dilated. If under these circumstances the strangulation should continue, the surgeon would, in search of the cause, direct his attention to the orifice in question. The constriction is effected by strong fibres, which are annular in relation to the protrusion, and become increased as the ring yields to the eccentric pressure of its contents.

Strangulation by the cribriform fascia* would in all probability be evident in the

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pression, cannot readily be returned, Sir Astley says, " the finger must be passed at least half an inch higher, and then the posterior edge of the crural arch, and the fascia transversalis will be felt, forming a sharp edge, strongly compressing the mouth of the hernial sac."—(Op. cit. Part II. p. 14.)

Mr. Allan Burns says—" The gut is not only bound down by the arch at the crural aperture, but also by the falciform process, after it has got beyond the ring; and thus there is a double source of strangulation."—(Op. cit. p. 270.)

Mr. Lawrence allows that this portion of fascia lata "contributes, *in some degree,* to the strangulation, as we may ascertain by passing the finger in the course of the rupture."—(Op. cit. 480.) Sir A. Cooper refers also to the possibility of a large hernial tumour being compressed by the edge of this process, (Op. cit. part II. p. 14,) and in an operation which I performed this process gripped the tumour so tightly that its dilatation was necessary in order to its being set free, and for the performance of the incision that had subsequently to be made. The tumour in this case was small but tilted forwards.

* Reference has already been made to Hesselbach's case, in which saccular protrusions took place from the crural canal through several of these apertures (14 *e*).

early part of the operation, from the proximity of the seat of stricture to the surface of the thigh.

(28)—It would be an easy, but comparatively fruitless task to do more than chronicle a few of the recorded modes of remedying ruptures which have been suggested and practised from the earliest dawn of surgery to the present time; including a period during which this science has assumed various positions, having at one time gained a high standard of excellence, whilst at another it has been degraded to, and even associated with, the practice of the meaner arts. The works of the Grecian, Roman, and Arabian writers, display little but extreme ignorance of the subject of hernia. A hernial tumour was regarded as an appendage, fraught with consequences to its possessor, possibly of the gravest kind; and therefore all the means that their art could furnish were applied with the view either to the entire removal of the hernial *bag*, or to the obliteration of its orifice. The works of Celsus contain a summary of their practices; and probably but little advance was made upon them prior to the dark ages.*

Upon the revival of literature, surgery appears to have emerged from its obscurity, but a little, if in any respect, affected by the gloom to which it had been consigned; and hence the earlier annals of modern surgery are but the records of the incisions alike of Celsus and of Ambrose Parè;—of the ligature, and its varieties in the form of the leaden or golden thread, and the royal stitch or suture of Fabricius, and of Nuck, and Le Dran;—and the suture, searing-iron, and caustics of Avicenna, Paulus Ægineta, Albucasis, Rhazes, and Haly Abbas, and of Franco. These practices have by degrees vanished before the light of scientific discovery, but especially before the advances of minute, and the cultivation of relational anatomy; for we find, not much more than a century since, that the sac was cut away for the cure of rupture, and not only so, but from its presumed connection with the testis, this organ was usually made to share the same fate.*

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* Interdum tamen vel ex ictu aliquo vel retento diutius spiritu, vel sub gravi fasce, interior abdominis membrana, superiore cute integra, rumpitur. . . Sequitur autem, cum superior caro mollis sit, ut non satis intestina contineat, hisque intenta cutis indecore intumescat. . . Quidam enim per acum duobus linis ad imam basim immissis sic utrinque devinciunt, quemadmodum et in umbilico, et in uva positum est, ut, quiquid super vinculum est, emoriatur. Quidam, medium tumorem excidunt, ad similitudinem myrtacei folii: quod semper eodem modo servandum esse jam posui; et tum oras sutura jungunt. Commodissimum est autem, resupinato corpore, experiri manu, quâ parte is tumor maxime cedat, quia necesse est, ea parte membrana rupta sit; quaque integra est, ea magis obnitatur: tum, qua rupta videbitur, immittendæ scalpello duæ lineæ sunt, ut exciso medio, interior membrana utrinque recentem plagam habeat; quia, quod vetus est, sutura non coit. Loco patefacto, si qua parte membrana non novam plagam, sed veterem habet, tenuis excidenda habena est, quæ tantum oras ejus exulceret."—(Celsi A. Corn. Medicinæ, Octo Libri, Edinburgi, 1831, p. 364.)

(29)—In taking a cursory review of the modern surgery of rupture, (for the distinctions between some of the more important forms of that affliction which now exist are comparatively recent discoveries,) I shall commence with those operations and modes of treatment which had for their object what is termed the "radical cure," most of which are but modifications of antient practice.

The obliteration or closure of the orifice of the sac, or its entire removal, were the ends designed by these proceedings; and these were to be effected by the following methods:

(*a*)—*By compression.* This method, adopted it appears with great success by Fabricio de Norsia, has in modern times been practised and commended, amongst others by Parè, Lieutand, Leblanc, Richter, Langenbeck, Ravin, and Beaumont.† Bandages, trusses worn tightly, and rough wooden blocks, have been severally used for this purpose.‡

(*b*)—*By compression* after scarifying the neck of the sac; recommended principally by Frietag, Manchart, and Richter.

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* Heister says, such is the state of surgery, that surgeons "know not how to cure the enterocele without the loss of the testicle."—(Observations translated by Wingman, p. 4, 1755.)

The natural aversion with which men regarded the loss of this important appendage, was taken advantage of by quacks, who appear to have vied in impudence and cunning with the members of their fraternity in our days. Dionis relates an instance of a charlatan, who alleged that he could excise the rupture without the testis. Many were the operations which this impostor performed; until at length the chirurgical mystery was solved, by his being caught in the act of dropping the morceau to an expectant dog, which invariably accompanied his master, and regularly took that position under the operating-table best suited for the performance of his part in the feat.

† It is recorded by Fabricius ab Aquapendente, that Fabricio de Norsia, the most eminent surgeon for ruptures in his days, was in the habit of operating upon 200 patients annually, but that, having found by experience that he could cure them by means of a truss and an astringent application, the number of his operations within the same period of time was immediately reduced to about 20.

In a case of congenital hernia, recorded in vol. ii. of Lancet, 1842-3, p. 433, I tried this mode of obliterating the mouth of the sac; and apparently with success. The patient, however, presented himself at the hospital a few months since, and on examination I found the portion of the sac which had been treated in the manner referred to still obliterated; but that from constant pressure of the intestine, and the *continued patent condition of the inguinal ring,* another pouch or sac had been formed from the portion of the peritoneum which adjoined the neck of the original sac. So that I am led to think that these operations cannot prevent the recurrence of the disease.

‡ The rough blocks were first proposed by Stagner.—(See American Journal of the Medical Sciences, vol. xvii.)

(*c*)—*By injecting the sac with wine and other irritants, or inflating it with air;* as Arnaud, Schreger, Von Graeffe, and Walther advised.*

(*d*)—*By inhealing a portion of skin into the orifice of the sac.* Dzondi, in a case of inguinal hernia, partially dissected out a portion of skin from the neighbourhood of the ring, and having pared the margins of the ring itself, thrust the portion of skin within it, and caused them thus to unite. Jameson performed a similar operation in a case of femoral rupture, uniting the edges of the cutaneous plug to those of the ring by means of suture.†

Another plan, proposed by Gerdy, was tried by Mr. Bransby Cooper in 1840, but in the end the patient had " a slight return " of the rupture.‡ It consists, in inguinal rupture, in first ensheathing a portion of skin upon the point of the finger and carrying it for some distance into the inguinal canal, and attaching it to the contiguous portion of its front wall by means of a strong suture, or of two or three, if the ring be capacious. " The sac formed by the ensheathed skin is then to be pencilled over with caustic liquor ammoniæ, to excite inflammation, the part operated on covered with a pad, spread with cerate, and covered with a compress, and the patient put to bed in such a position that the rump and the head are somewhat raised, and the thighs drawn up. In all cases phlegmon follows, which spreads over the whole extent of the stitches, and runs into suppuration; the *pus* discharges itself through the stitches, along the threads, which at the same time also act as guides to it. If the adhesion have taken place in from three to five days, the stitches may be removed. Towards the fifteenth or twentieth day, the suppuration ceases, the ensheathed skin forms a plug which externally appears like a swelling, but gradually subsides."§ The retention of the skin has also been accomplished by Signoroni ‖ by means of hare-lip needles, and sutures so strongly wound around them, as to excite adhesive inflammation in the included tissues.

A fourth mode was recommended by Bonnet, which consists in passing a strong pin, having a small block of cork in the place of its head, through the integuments and neck of the hernial sac; another small block is then to be passed on the

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[*] In the works of Ambrose Parè a more particular description of these methods may be found.

[†] Lancet, vol. ii. 1829.

[‡] Guy's Hospital Reports, October 1840. " Gerdy had, up to the present time, had the greatest success: I have, however, seen a recurrence of the disease, and according to Breschet, the results have in several instances been unfortunate."—(Chelius, t. ii. p. 28., by South.)

[§] A System of Surgery, by Chelius, translated by South, vol. ii. p. 25.

[‖] Chelius, Op. cit. p. 25.

pin at its opposite extremity, and the included parts are to be tightly compressed between the two blocks, until a certain amount of inflammatory action is excited, and the skin in contact with one of them begins to ulcerate. This usually occurs between the sixth and twelfth day; by which time a sufficient quantity of plastic lymph is effused not only to close the hernial sac but also the ring, and so firmly to unite both with the neighbouring tissues, that a complete barrier is thereby made to any future descent.* Several pins may be used, if necessary; but the cord in the case of an inguinal rupture must be cautiously excluded from the sphere of operation.

The proceedings recommended with the same view by Mayor † and Belmas ‡ vary from those already noticed in detail only. The former advocates the formation of a fold of skin, the centre of the base of which shall be made to unite with the tissues *occupying the hernial ring*. The fold is to be formed by pinching up the skin, passing some strong threads through it, and maintaining it in the plicated state by tying pieces of bougie, or sponge, to the ends of these threads, until it is rendered permanent by adhesive inflammation. Some compression is generally required in order to produce the necessary amount of inflammatory action after the introduction of the threads, and this must be kept up until the processes are completed, which generally require a period from six to nine days. M. Belmas contrives to set up obliterative inflammation in the neck of the sac by introducing a little bag or bladder of goldbeater's-skin, filled with air, into its orifice through an incision for that purpose.§

(*e*)—*Removal of the sac.* Le Dran, Petit, and others recommended this formidable proceeding; but experience of the dangers contingent upon it caused the latter surgeon to abandon it, with the following sensible remarks:—" I opened the tumour, replaced the omentum, removed the sac, tied it as I had seen it done, and then dressed my patient." In two hours severe pains came on, with gripings over the whole belly. " I hastened to my patient, fancying that the intestine might have slipped into the ring and become strangulated; but when the dressings were taken off, and nothing was discovered in the wound, I concluded the evils had arisen from tying the sac. I cut the ligature and removed it, dressing the parts simply; the symptoms were relieved, and in an hour entirely ceased. This is not the only observation I have made upon the subject; and from all I have seen, I am confirmed in the opinion that the ligature of the sac, or in other words *of the peritoneum*, since the sac is formed by that membrane, may bring on symptoms very like those caused by strangulation of the intestine. I cannot doubt that those whom I have seen perish after the employment of the *punctum aureum*, have died from inflammation of the viscera, caused by tying the sac."*

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* For a more detailed account of this operation, see Journal des Connaissance Medico-Chirurgicales for July 1836; also Gazette Medicale for the same year.

† Sur la Cure radicale des Hernies, Paris, 1836.

‡ Recherches sur un moyen pour determiner des inflammations adhesives dans les Cavites serieuses, Paris, 1829; and Revue Medicale for March 1838.

§ This proceeding of M. Belmas is said to have succeeded both in man and animals. And it is further alleged that the obliteration of the orifice in the neck of the sac was brought about in these cases by the *organisation* which the whole is said to have acquired.—(For further particulars the reader is referred to Nouv. Elém. de Medic. Operat., par M. Velpeau, tome ii. p. 306, et seq.)

Schmucker is said to have cured two irreducible ruptures, free from strangulation, by cutting away the body of the sac after tying its neck.†

In one case of femoral rupture Sir A. Cooper removed the whole sac, and passed stitches through its mouth, so as to bring the edges into perfect contact. The sutures came away on the sixth day, and the wound was healed by the tenth. In a month afterwards Sir Astley was surprised to find another hernia presenting itself on the same spot, which was then as large as that for which the operation was performed.‡

In addition to the argument which Petit urged against this operation, Sir Astley Cooper made the following objection to it:—" It appears, therefore, that the removal of the sac will not prevent a return of the disease; and indeed, when it is recollected that the aperture from the abdomen continues of the same size after, as before the operation, and that the peritoneum will still remain the only obstacle to the descent of the intestine, it does not appear probable that this highly extensible membrane should succeed in preventing a return of the same hernia, the first formation of which it was unable to resist.§ Mr. Lawrence entertains the same unfavourable view of these operations; but Chelius alludes to one class of cases in which the radical cure might with propriety be hazarded, viz., that in which a reducible rupture cannot be kept up, even when the patient is in a supine posture, and has the assistance of a truss. In such a case, this eminent surgeon gives the preference to the plans of Gerdy and Mayor; but qualifies his commendation of the experiment by the statement, that with the greatest amount of success a truss must always be worn subsequent to the operation.*

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* Traité des Maladies Chirurgieales, vol. ii. At the latter end of the 17th, and commencement of the 18th century, this was the usual mode of treating rupture. Heister says, that throughout Germany, at the fairs in the large towns, mountebanks had persons brought to them from all parts for these operations; and he mentions a case at Frankfort, at the Easter fair, in the year 1700, in which one of these itinerant doctors, named Eisenbart, operated upon a lad, and cured him in three weeks. This writer further remarks, that the success of these operations was not known; for the sufferers came to the fairs from long distances, and were never heard of after.—(Op. cit. p. 4.)

† Cooper's Dictionary, p. 730.

‡ Op. cit. p. 62.

§ Op. cit. p. 62.

(*f*)—The device of these various plans, with the view of effecting a radical cure in cases of rupture, resulted from mistaken ideas of the nature and connection of the hernial sac, as well as from the small amount of information which anatomical research had elicited in reference to the subjects of hernial displacements generally. A strangulated hernia, at the period when they were so commonly practised, was known only in as far as its symptoms and tendencies were concerned, but its treatment by liberation of the strictured parts was hardly thought of; and that person was accounted sadly blind to his own safety, who, with a rupture, neglected by the means which these proceedings afforded to secure himself from the peril which, in case of its strangulation, he would assuredly incur.

(30)—In the 16th and 17th centuries, Franco and Parè proposed to liberate a rupture when strangulated by *dividing the seat of stricture;* but their proceedings were based upon such insufficient and uncertain foundations, that the remedy was almost as hopeless as the disease, as may be gathered from the "miserere mei,"† the vulgar expression at that period made use of to designate the stage of the complaint at which chirurgical interference of this kind was called for.‡ Parè attributed *strangulation* uniformly to the narrowness of the orifice of the peritoneal sac; and his plan of relieving the incarcerated parts was to make an incision through the skin, and then to slit up the straitened passage upon a canula introduced within the stricture. The parts were then returned, and the wound of the peritoneum, as well as that of the integuments, were brought together by sutures.§ Parè did not apparently distinguish between the several structures which constricted the neck of the sac, and the sac itself; and hence his view of the seat of stricture is comprehended in the following passage from his works:—" It often happens that the guts cannot be restored because the process of the peritoneum is not wide enough:" and then follows the mode of dilating it.

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* Op. cit. vol. ii. p. 28.

† The expression, "miserere," as expressive of this condition of the patient, was also made use of by Mr. Pott.—(Op. cit. vol. ii. p. 114.)

‡ The *bubonocele* of this surgeon was, I am much disposed to think, the femoral rupture of our day, but mistaken for an inguinal rupture imperfectly formed, "which *descends not beyond the* groins;" the *enterocele* being the same with the latter variety, in which the rupture is *complete* and the gut *descends into the testicles.*—(Works of Ambrose Parè by Johnson, 1665.)

§ Op. cit. vol. ii. p. 43. It is said by Chelius that Parè divided the structure on the *outside* of the sac; and that he only operated from within when he found reduction of the rupture could not otherwise be effected; but I cannot discover any authority for such a statement.

(31)—Verheyen's reputed discovery of the difference between the seats of inguinal and femoral rupture introduced a new era in the annals of hernial surgery. "Alius huic vicinus locus est, ubi fiunt herniæ periculosæ et sæpe lethales; scilicet, ubi venæ et arteriæ iliacæ tendunt ad crura."* Verheyen adds, adopting Parè's explanation of the mode in which a rupture is formed: " Siquidem peritonæo paululum delato, aut quod rarissime contingit, rupto, descendet exigua pars intestini ilii:" but proceeds in advance of his predecessor, " ibidemque *partibus vicinis* accrescit, ex quâ accrescentiâ vidi particulam intestini ilii omnino occlusam, et ægrum miserere morientem," etc.

In this passage there appears to be a dim recognition of a seat of stricture, which includes the neck of the sac, *and parts contiguous to it;* and of these parts the ligament of Fallopius or Poupart was supposed to be the principal.†

(32)—The objections to the division of the crural arch, arising from the danger which it was presumed would be incurred by wounding a ligament so important as it was now deemed to be, as well as from the risk to the large vessels, which take their course in its immediate vicinity, led to the invention, by Thevenir,‡ of his two-branched dilator; also to that of the hook, or crochet, by Arnaud,§ and subsequently of another dilator by Le Blanc.‖ An incision was to be made over the hernial tumour sufficiently large to admit whichever of these instruments was deemed most suitable to the case; and when the *ring*, into which the dilating portion of the instrument had to be cautiously insinuated, had been sufficiently distended, the parts were to be replaced. The use of these several dilators, although approved by Lafaye, Richter, and Scarpa, has been abandoned, for reasons which were summed up by Breschet, in the following passage:—" Cette dilatation par le crochet d'Arnaud ou l'instrument de Leblanc, doit être considéré comme inutile lorsque l'estranglement, existe à l'orifice antérieure du canal;" for as this author elsewhere remarks, the division of the fasciæ which is required in order to reach the seat of stricture, suffices for the liberation of the parts; "Comme insuffisante, si l'estranglement est produit par le ligament de Gimbernat et comme dangereuse, parce qu'elle froisse ou les vaisseaux fémoreaux, ou les parties contenues dans le sac herniaire." Moreover, in cases of adherence of the protruded parts to the neck of the sac, "Comment alors introduire-t-on l'instrument?*

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* Corporis Humani Anatomiæ, Lib. Pri. Authore Philippo Verheyen. Bruxelles, 1710. Sabatier says, " La hernie crurale a été connue de Paul Barbette qu'écrivait vingt ans avant Verheyen".—(Med. Op. t. ii. p. 405.)

† " Atque hinc incarcerationem posse produci quin necesse sit causam incarcerationis quærere, in contractione fibrarum ligamenti Poupartii."—(Icones Herniarum Bonn, 1781.)

‡ Œuvres de Thevenir. Paris, 1669.

§ Arnaud, on Hernia, 1748.

‖ Nouvelle Methode d'operer les Hernies, par M. Hoin. Orleans, 1767. These modes of dilating the stricture were recommended as well in crural as in inguinal herniæ, especially by Leblanc. "Dr. Trüstedt has published some remarks in favour of employing dilatation, instead of incision, in the operation for strangulated crural hernia."—(See Rust's Magazin für die gesammte Heilkunde, b. 3. h. 2.) These remarks were made consequent upon the division of the obturator artery, when taking a course from the epigastric along the upper and inner edge of the crural ring, and the consequent death of the patient, at la Charité, Berlin.—(Cooper's Dictionary of Surgery, p. 741.)

(33)—Anatomy had now determined that the several structures immediately surrounding the *neck* of the visceral tumour were the most important objects of the surgeon's attention, in his attempts to liberate a strangulated femoral rupture.† The operation of herniotomy was rendered more simple by these discoveries; and comprised; first, the division of the skin and hernial coverings over the seat of stricture; and, secondly, the division of the stricture itself.

(*a*)—The *seat* of the first of these incisions would be materially influenced by the choice which the operator makes of the particular site for the second, and the depth to which it is probable he would have to carry it; whilst his views of convenience would determine its shape and direction. By Platner, the incision was usually made *across* the tumour; whilst Rougemont recommended that it should be made in the direction of its long diameter.‡ M. Dupuytren and Sir A. Cooper advised two incisions, traversing each other, either crucially, or so as to resemble the letter T reversed, having the point of their union over the middle of the tumour; by which sufficient room would be gained for any emergency which might arise in the course of the operation. Mr. Lawrence prefers that the incision should run obliquely downwards and outwards, beginning an inch above the crural ring; "because," says Mr. L., "it runs over that part of the ligament which I propose to divide, in order to set at liberty the strangulated parts.§ Mr. Key appears to adopt either the crucial or the longitudinal form of incision, as the one or the other might appear best adapted for the peculiarities of the case. Mr. Luke, one of the most successful operators of the day, recommends a small longitudinal incision, with its centre "between the upper part of the tumour and the abdominal surface;" *and in such a situation that in the after steps of the operation the tumour itself will be subjected to the least possible amount of interference.** Mr. Teale, differing slightly from Mr. Lawrence, makes his incision parallel to Poupart's ligament, whilst Mr. Hilton, in cases of large herniæ, recommends a single semilunar cut across the upper third of the tumour, having its convexity downwards.†

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* Op. cit. p. 166-167. 1819.

† It should have been stated in connection with the description of the femoral ligament, that Mr. Pott's attention was directed to this structure, which he specified as "a fine tendinous expansion, communicating between the tendon of the obliquus descendens abdominis and the fascia lata of the thigh. *Under this* tendon, or ligament, the parts composing a hernia pass, and produce a tumour on the upper and fore-part of the thigh."—(On Ruptures, p. 151, 2.)

‡ Richter, Traité des Hernies, tome ii. p. 155.

§ Op. cit. p. 502.

Mr. Law operated upon two cases in the Royal Infirmary of Edinburgh by making his preliminary incision according to the proposal of Mr. Else, of St. Thomas's Hospital, through the aponeurosis of the external oblique, just above and in a direction parallel to the crural arch.‡

(*b*)—These incisions, with the exception of the last, are made *over* the hernial tumour, and carried into the coverings, abnormal or otherwise, which help to compose it; so that occasionally they have to be fearfully large and deep, on account of the aggregate thickness of these coverings. Moreover, they have frequently to encounter, not only glands and vessels alien to the part, either in a condition of health or changed by the processes of disease; but also formations and growths altogether new, such as deposits, tumours, and cysts of all kinds, even of the parasitic order, the nature and connections of which could not but be hypothetical to the most profound pathologist, and therefore embarrassing even to a practised operator. Wounds of such parts are of themselves fraught with danger: and amongst the records of fatal cases, those are to be discovered in which the erysipelatous inflammation, gangrene, or long-continued suppuration which ensued, can alone account for their unsuccessful issue.

(*c*)—For the *division of the stricture*, as it has been supposed to exist equally in every part of the crural ring, in common with the textures immediately contiguous to it, several points in its circumference have been selected. Mauchart proposed to divide that portion of Gimbernat's ligament which is prolonged upon the ramus of the pubis, urging in its favour that the epigastric artery would thereby escape being injured. Although this proposition received, to a certain degree, the support of Richter and Scarpa, the difficulties of carrying it into effect were found to be so great, and the advantages claimed for it so doubtful, that it failed to maintain the favour with which it was at first received.

(*d*)—The dilatation of the stricture, by dividing it from within *forwards* or *upwards* as far as the thin edge of the crural arch, or even by carrying the incision onwards, as some have directed, through some of the fibres of that structure, was next suggested. Amongst the earlier advocates of this mode was Arnaud; but whilst making the incision on one occasion, he divided the spermatic artery.* Mr. B. Bell, according to Gimbernat, was the first to propose a safe plan of dividing the crural arch, but his incision was too much of the heroic order; for we are informed that, having introduced his finger between the intestine and the ligament, he made a very superficial incision from above downwards into its thickest part as far as its lower edge, and thence continued his incision about an inch, without cutting quite through it.† Experience, guided by caution, taught surgeons by degrees that a slighter incision of the stricture in this direction would give the necessary amount of freedom to the strangulated parts; and we accordingly find Mr. Hey confessing that he had "gained a knowledge of the proper manner of performing the operation before he had acquired from anatomical investigation a just idea of the part which principally causes the strangulation," believing, however, that it was Poupart's ligament (12 *f*).‡

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* Abstract of paper read at Medico-Chirurgical Society, and reported in Lancet for March, 1848.

† Teale on Hernia, 1846, p. 333. Lancet, March, 1848.

‡ Edinburgh Medical and Surgical Journal, vol. ii. p. 205.

Sir A. Cooper recommended, that after opening the sac, a probe-pointed bistoury should be pushed into the crural sheath at its anterior part, "and the sheath is to be cut as far as the anterior edge of the crural arch, or Poupart's ligament." . . . "If the intestine, when slightly compressed, cannot readily be emptied (returned), the finger must be passed at least half an inch higher, and then the posterior edge of the crural arch and the fascia transversalis will be felt, forming a sharp edge, strongly compressing the mouth of the hernial sac." This edge must then be divided; but in case the hernia should be large, "it may be sometimes, though very rarely, necessary to cut through the anterior edge of the crural arch, or Poupart's ligament, and this may be done from the inner side of the hernial sac, by cutting obliquely upwards towards the umbilicus." But in a femoral hernia in the male subject, in order to avoid wounding the spermatic cord, Sir Astley recommended that an incision be made through the tendon of the external oblique muscle just above the crural arch, so as to expose the cord; and that it then be removed out of the way by the finger or a hook, whilst the division of the stricture, according to the plan just described, is effected.§

In order to avoid the risk of wounding the cord by this incision, Scarpa recommended that the necessary amount of dilatation should be gained by a series of small cuts or notches, instead of a single but deeper section.

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* Disput. Chirurg. Select. Colleg. tom. i. p. 154, Lausannæ, 1775.

† Gimbernat, Op. cit. p. 27.

‡ Lawrence, Op. cit. p. 508.

§ Op. cit. pt. 2, edit. 2, p. 13-15.

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Amongst the surgeons of the present day, Messrs. Key, Luke, and Teale, advocate the upward or forward division of the stricture; limiting the incision, however, to the structure which constitutes the *deep arch,* viz., the *femoral,* or Hey's ligament. Mr. Guthrie, under the impression that the stricture is caused by the posterior or deep edge of the fascia lata, as it forms, first the falciform process, and then the free edge of Gimbernat's ligament, (12 *c*,) asserts that the stricture exists more often "anteriorly than posteriorly" (laterally); and therefore advocates a slight incision, and that upwards; taking care that the cord, if necessary, be drawn out of the way. In the performance of this operation the risk of wounding the cord should ever be present to the mind of the operator.

(*e*)—The dread of wounding the cord, and the fact that the spermatic artery was repeatedly divided in experiments made on the dead body by Bandon at the Hôtel Dieu, as stated by Gimbernat, led that surgeon to propose a third method of dividing the stricture by an incision directed *inwards* towards the pubis. I do not, however, see the difference between Gimbernat's operation and that which had been practised by Le Dran[*] and Heister. Mr. Hey at *first* adopted this method; but it has been severely criticised by M. Dupuytren, Sir A. Cooper, and Mr. Key; of whom the latter says, "The difficulty I have witnessed in relieving the stricture when the operator has divided Gimbernat's ligament towards the pubes, and the necessity of repeatedly introducing the bistoury, give decided superiority to the upward division of the stricture, which mode of division includes the tendinous band referred to."[†] It has however had an able and a warm advocate in Richter,[‡] and, with a slight modification, in Mr. Lawrence, who, with Mr. Todd and many other surgeons, still give it the preference.[§]

Sir A. Cooper objected that the depth from the surface at which the incision of this ligament had to be made is so great, and the protruded parts are so closely embraced by the tendon, that there is danger of the intestine getting before the edge of the knife, or of its being lacerated should it be held on one side. Mr. Lawrence admits these objections, and meets them by the following proposal:—" I consider the best and safest mode of executing this part of the operation to be that of dividing the thin posterior border of the crural arch *near to its insertion* in the pubes. This is the very part which constitutes the stricture, and where a smaller division will accomplish our object than in any other situation. Half an inch in all cases, and in many instances a longer space, may be gained in this quarter. . . . It must be acknowledged that the tightness of the stricture, and its depth from the surface, are serious difficulties in performing this operation. If, therefore, sufficient room could be gained by dividing the parts between the mouth of the sac and the crural arch on the anterior part of the rupture, in the way recommended by Sir A. Cooper, that method would be preferable. . . . I would therefore advise this plan, with caution, not to extend the cut through the arch; and if sufficient room were not gained, the process recommended above may be followed. In all the cases in which I have operated, a division of the *posterior* thin edge of the crural arch has been necessary."* " In this mode of operating," says Mr. L. further, " we shall entirely avoid the spermatic cord and epigastric artery in the ordinary courses of the vessel. It must be allowed, that in the less frequent distribution, which has been described above, the obturatrix artery will be endangered. The risk is not sufficient to induce us to exchange this for any other method that has hitherto been proposed; as I know of none which avoids the vessel more certainly, while in facility of execution, and in other advantages, this has the undoubted preference."†

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[*] Le Dran's incision was made "obliquely towards the linea alba."—(Operations, translated by Gataker, 1768, p. 104.)

[†] Op. cit. Part II. edit. 2, p. 14 note. It must not, however, be overlooked that the reverse of this statement is also on record. After dividing "Poupart's ligament, M. Chevalier was obliged to divide the mouth of the sac towards the symphysis pubis, in order to release the intestine." Mr. C. adds, "that less reliance is to be placed for the removal of the stricture, either in the division of the ligament described by Mr. Hey, or of Poupart's ligament, (*both* of which were completely divided, in the case I have now related, without producing a sufficient liberation of the incarcerated parts), than on the division of the mouth of the sac," towards the pubis. —(Medico-Chir. Trans., vol. iv. p. 324.)

[‡] Traité des Hernies, p. 249.

[§] Mr. Todd's mode of operating is similar to that practised by Mr. Lawrence. Mr. T. says that it is necessary to divide a few only of the fibres of Gimbernat's ligament; but that the incision should be carried deeper, should the first be insufficient to free the parts.—(See Dublin Hospital Reports, vol. i. p. 254.)

(*f*)—A *fourth* mode of dividing the ring remains to be noticed, viz., by an incision directed from within *upwards* and *outwards*. Mr. Sharp was amongst its earliest advocates; and to the objection that the epigastric artery was in danger of being cut, responded that such an accident " ought not in the least to embarrass the operator, for were the epigastric artery much larger than it is, we might instantly take it up, now that the use of the crooked needle is become so familiar."‡ It was practised also by Petit, Rougemont, and Richerand; and Hesselbach preferred this mode of cutting the stricture in women, but that of Gimbernat in men. M. Dupuytren, says Dr. Breschet, " preferé ce procédé à tous les autres, mais il se sert, pour l'executer, d'un bistouri assez long, courbé, boutonné, et tranchant sur sa convexité."* It is said that this eminent surgeon has never been known to wound the epigastric artery by this mode of operating. The objection which Mr. Sharp met with so much *sang froid*, has in these days proved fatal, or almost so, to this plan of dividing the stricture; indeed, there appears no adequate reason why it should be practised, when the incision, either directly forwards or in the direction of the pubes, has equal advantages in relation to the structure, and is attended with less risk, as far as the epigastric artery is concerned.

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* The thin edge of the crural arch of Mr. L. corresponds with the edge of Gimbernat's ligament as I have described it. Professor Ferguson appears to recommend the adoption of this method of relieving the stricture.—(See Practical Surgery, p. 524.)

† Op. cit. p. 512 and 508. See sect. 24.

‡ Op. cit. p. 50.

(*g*)—At the *ring,* distinct seats of stricture exist, especially where the hernial neck is large; one, in front, formed by the unyielding edge of Hey's ligament, and the adjoining thin edge of the crural arch; the other, on its pubic side, by the last portion of Hey's and Gimbernat's ligaments (26 *c*). Hence the division of the seat of stricture towards the pubes will relieve tension exerted by the mass *latterly;* but it will sometimes be necessary to relieve tension exerted in the direction of its antero-posterior diameter, by dividing the stricture in front, in order effectually to liberate the strangulated parts. Mr. Lawrence's advice is, therefore, most suitable for all operations external to the sac; but *reversed,* as I believe Mr. L. is now in the habit of giving it in his Lectures.

In the operation which I am about to recommend, it will be found convenient, first, to divide the seat of stricture *towards the pubes;* and then, from the same wound, *forwards,* should the rupture, after the first incision of the stricture, resist the most gentle efforts to return it.†

The danger from wounds of the obturator or epigastric, should they be in the way of the knife, is not so great as many writers have represented. Velpeau discovered in the body of a person who had died from a penetrating wound of the abdomen, an *inconsiderable* quantity of blood, which had flowed from the wounded epigastric artery. The hæmorrhage had ceased spontaneously.‡ Mr. Lawrence relates one case in which the epigastric was divided during an operation for inguinal hernia, and no bleeding whatever ensued; and another in which profuse bleeding took place after dividing the stricture upwards and outwards for femoral hernia, but stopped immediately on the patient's fainting.§ In my own practice, I have seen a wound, undoubtedly of the epigastric, and the bleeding checked by pressure, kept up for some hours without intermission. This vessel has in other cases been tied after being accidentally divided. The wounds of the obturator could not prove more serious.

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* Op. cit. p. 183.

† Nouv. Element. de Med. Operat. tom. ii. p. 471.

‡ Op. cit. p. 271, 2.

§ Sir A. Cooper on Hernia, Part I. 2nd edit. p. 41.

(34)—The earlier surgeons divided the stricture from *within* the hernial sac; and there can be no doubt that at the beginning of the eighteenth century, there were valid reasons (21 *e*, and note,) why in the majority of cases this mode of proceeding was adopted; for we find Petit and Le Dran not only fully sensible of the advantages which would arise from dividing the stricture without opening the sac; but also of the pathological conditions of the sac, which rendered that mode of procedure inadmissible, and of *their frequent occurrence at that period in herniated subjects.* In the review which will be taken of the operation *without opening the sac,* it will accordingly be seen, that it fell into disuse shortly after its first introduction.

In his " Operations of Surgery," translated and published in 1723, Garengeot says, " Last May, 1718, I saw a *crural* hernia in a woman, the operation of which had been made by M. Petit without opening the bag. He only made use of his cushion, and the patient, though advanced in years, was well cured in eighteen days." (P. 132.) Le Dran also attempted to operate in a like manner on a crural rupture as early as the year 1726;* and remarked, that in case " you can be certain that the intestine can be found, you may dilate the ring without opening the cystis hernialis; a practice, however, from whence no great advantage results to the patient." †

In the new edition of Petit's works, which appeared in 1790, is this passage—" Il y a plus de trente ans que j'ai mis cette méthode en pratique pour la première fois; et elle m'a réussi; plussieurs l'ont censurée; je vais rapporter leurs objections, j'y répondrai en peu de mots; le lecteur sera juge;" ‡ from which there is the best reason to conclude, that his operation (as it is now termed) had been successfully employed by him, long before it was adopted by Dr. Monro. Petit's directions for the operation and its contingencies are worth recording. " After the surgeon has laid bare the hernial sac, and removed the fat and other tissues that cover it as far as the ring; he takes a broad sound, curved at the end and grooved in the middle, insinuates it between the ring and the sac, and passes a bistoury into the groove, with which he divides that part of the ring which lies over the end of the sound. By these means the sac remains entire, and the tension of the ring being lessened, the included parts are somewhat released from constriction, and the surgeon with slight force can return them." "If," continues this author, "after reaching the sac, the parts can be returned without opening it, it should be done; and, moreover, if the constriction will allow the parts to be returned by the exercise of a little pressure made in the direction of the abdomen, a division of the stricture is not required; but if the constriction will not allow the parts to be returned in this manner, then the ring must be divided sufficiently to release them; should the parts be retained by adhesions, these are also to be divided. . . . . Again; should these adhesions prevent the return of the parts, the operator would commit a great error in cutting them, if in so doing the intestine is likely to be wounded, or if, on the other hand, it is likely to be perforated by means of a gangrenous slough, or other cause; under these circumstances it should be retained without the seat of constriction by suture, if it should not already have contracted adhesions."*

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* Le Dran's account is as follows, and is worthy of attention:—" I began (the operation) by discovering the cystis in the common method; and then, dividing the ligament, endeavoured to reduce the parts without opening the cystis hernialis; but I soon perceived that the closest strangulation was not made by the ligament, and that the mouth of the cystis was contracted by the pressure of the bandage upon it. Then introducing my finger, I found that the cystis resembled a purse drawn together; and that the entrance into it being so very strait, was alone sufficient to prevent the reduction."—(Observations in Surgery, 2nd edit. Lond. 1741, p. 192.)

† Op. cit. p. 205.

‡ Tr. des Malad. Ch., vol. ii. p. 329.

The new mode of operating was assailed by objections which were combated by its author with great ability and undoubted success.†

"In the first place," he says, "it is objected that this operation is difficult; if it be performed, as I have just described, with the director that is peculiar to myself, there is not a surgeon who could not perform it with ease, however little dexterity he may possess; but the difficulty of a thing is not the question, when it is useful and practicable. It is said, in the second place, that fluids are found shut up in the sac, which are returned into the cavity of the abdomen, where they may produce mischief; but I will ask those, who make this objection, would they not, if they had reduced the tumour without an operation, have returned it with the fluids which were contained in the sac? It is a mistake to suppose that this fluid can produce any mischief; it is analogous to that which moistens the interior of the abdomen, and, doubtless, comes from the same source. Another objection is, that if the intestine or omentum be in a state approaching to gangrene, and being returned into the abdomen, suppurate or give way, the fœcal matters, not having an outlet at the ring, spread over the abdominal cavity, and destroy the patient. This objection is not founded upon the observations I have made in my public lectures concerning this manner of operating, but upon what has been written by some authors who have quoted me; and who, from not having quite understood me, have attributed to me and made me say things that never entered my head. . . . Had I pretended that the disengagement of the ring without opening the sac was a *general* mode of operating, my critics would have been correct in some points; but those who have done me the honour to assist at my operations know, if they have attended to my practice, that I do not practise it in all cases; on the contrary, I may say, I have not made it as general as it might be rendered. . . . My opinion is, that with the exception of gangrenous herniæ, those in which the intestine is loaded with scybala, and some of those in which the intestine contains foreign bodies, all others may be treated in this manner; there are some even which ought not to be treated in any other way." *

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* Op. cit. p. 345.

† Heister's principal objections were:—that the sac sometimes adheres to the spermatic vessels; that the herniated omentum or intestine is sometimes in a condition of suppuration, and cannot be cured unless the sac be opened; that the sac contains fetid and achorous matter, which would be pernicious to the peritoneum were it poured back into its cavity; adhesions of the intestine to the sac, which require breaking down; and that the sac by remaining entire affords the opportunity of another descent of the rupture.—(Heister's "General System of Surgery.") Richter objected, besides the difficulty in the performance of this mode of operating, and the danger from the escape of the irritating fluid contents of the sac into the abdominal cavity, that the condition of the contents of the sac, as to adhesions, inflammation, or gangrene, can only be ascertained by opening it; that it is not practicable when the cause of strangulation, as Le Dran and others had shown (21 *e*), existed in the neck of the sac itself, or in some other part, either containing, or contained in, the hernial mass. This surgeon, however, makes some reservation, and adds, "I therefore think that this plan of operating is not to be rejected in every case; but that it may in certain cases be had recourse to with advantage."—(See Rougemont's Translation of Richter's Traité des Hernies, 2nd edit. Bonn, 1788, p. 320.

Petit, like his contemporary, does not appear to have attached that importance to this mode of operating which modern surgeons almost unanimously ascribe to it; nor to have regarded the immunity of the sac from being wounded, as of much consequence either to its still more susceptible contents, or to the remainder of the peritoneal surface at large.

In this country the new method was first advocated and practised by Dr. Monro, (secundus;) and to this distinguished anatomist and surgeon the merits of a discoverer in reference to it are due. Probably he was only acquainted with the case of Petit, which Garengeot had published. He might have caught the rumour that Petit had operated in a similar manner in other cases, with equal success; but it remained for him to work out, by cautious experiment and severe study, the principles upon which the new operation could either rest its claims to the character of a scientific proceeding, or, as a practical measure be of any real value to hernial surgery. Had it been allowed to remain where Petit left it, the new method might have been consigned to early oblivion; but Monro imparted to it the elements of durability, by basing it upon some of the most important pathological truths that were at that period elicited. Observing the generally unfavourable results of hernial operations, he commenced a series of experiments upon animals, from which he was led to conclude, that exposing the peritoneal cavity and the intestine to the influence of the air, and handling it, were of themselves sufficient to bring about a fatal issue; and hence, that in all cases where other circumstances did not forbid, it was most desirable that the hernial sac should be allowed to remain entire. "If there be the smallest chance that the inflammation (of the intestine) may terminate without mortification, it is equally certain that nothing can be so pernicious as opening the sac, and that the bowels should be returned without exposing them to the air."* The cases in which Dr. Monro successfully performed this operation occurred between the years 1770 and 1782. In the first it was performed on a woman thirty-five years of age, who had for three days suffered from a strangulated femoral rupture. Mr. Wood, who, it appears, operated under the direction of Dr. Monro, was prevailed upon to "cut the tendon without opening the sac," upon which the bowel was returned with the greatest ease. In the second, a case of congenital hernia, the neck of the sac, as well as the tendon of the oblique muscle, were extremely constricted. "After cutting the skin and tendon, we with much difficulty divided the stricture at the neck of the sac; and having reduced the bowels, we stitched the teguments."† The third case was that of a gentleman above sixty years of age, with a large hernia, in a state of strangulation. The incision of the tendon was easily made outside the sac, and the results were most satisfactory. The last was that of a woman at thirty-five, who had laboured for two days under a strangulated femoral rupture. After dividing the tendon, the parts could not be readily returned, owing to the constriction which the thickened neck of the sac was found to exercise upon them. In this instance, Dr. Monro directed a small opening to be made in the peritoneum, *above* the seat of stricture; and after introducing a probe, curved at its point, the strictured portion of the sac to be divided upon it. This mode of treatment is still adopted, under similar circumstances, with the slight modification of dividing the stricture in the sac from *below upwards*, instead of in the opposite direction.

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* Transferred from Mr. Key's Monograph. Op. cit. p. 79, 80.

Sir Astley Cooper operated on several occasions in the manner under consideration; but I am unable to gather from his works that he was favourable to its general adoption, even in cases where the seat of stricture is without the sac. In the second edition of his work, Sir Astley says, "I have occasionally practised, and for some time recommended in my lectures, the following mode of dividing the stricture, without including the sac." . . "I was led to adopt this method by the result of a case, related in a preceding chapter, in which I had reason to doubt whether the aperture in the intestine was not caused by the knife, &c. ;" and after stating that he had known two cases in which this result attended operations in which the sacs were opened, adds to this negative advantage, in favour of the new plan, the following remark : "That if by a mistake of the operator the epigastric artery is cut, as the peritoneum is undivided, the flow of blood would be immediately perceived, and then the vessel might be secured ; whereas, if the sac is included in the incision, the artery would bleed into the abdomen, and the consequences might be fatal, without the cause being known but by dissection."*

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* Work on Bursæ Mucosæ. By Monro.

† Op. cit.

Sir A. Cooper recommended this method unreservedly in *large* herniæ, when the neck of the sac is unconstricted, as well as in those cases of *small* herniæ, in which it is desirable and possible to return the sac into the abdominal cavity ; but in other small herniæ, on account, I presume, of the tightness of the constriction and urgency of the symptoms which generally characterize these cases, objected to its employment : and in allusion to crural rupture he makes the following remark : "When the hernia is small, the practice of not opening the sac becomes objectionable, on account of the risk of gangrene ensuing in the coats of the intestine. The aperture in the femoral rupture is so narrow, that long-continued pressure is more likely to be attended with fatal consequences to the intestine than in the inguinal species," &c.

These objections to this method were, it is obvious, principally derived from the practice which prevailed at that period, of leaving the patient until at death's door, and trying every means that art could suggest, even to the use of a mischievous amount of violence, in order to reduce the rupture, rather than have recourse to an operation. The harm to the peritoneum, both from exposure to air and from handling, was of minor consequence to the terrible condition which the strangulated parts were thus allowed to assume before the question of giving them relief by an operation was even entertained. But whilst caution and insufficient experience of its merits led Sir Astley to refrain from giving that sanction to Petit's method, which might have led at once to its general, and probably pernicious adoption ; yet with his usual sagacity he evidently perceived its merits, and was prescient of the rank it would in future take in hernial surgery. "I feel convinced," he writes, "that this operation will be gradually introduced into general practice, *when it has been fairly tried*, and found, *if performed early*, to be free from danger, and attended with no unusual difficulty."

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* Op. cit. second edition, p. 39.

In 1829 Mr. Key made his first attempts to revive and render more general the practice of Petit's method of operating: and to the efforts of that gentleman and those of Mr. Luke, the favour in which it at present stands is principally to be ascribed. Mr. Key, after attempting, though unsuccessfully, to reduce an inguinal rupture without opening the sac, made the following remarks in a clinical lecture, recorded in the Medial Gazette for July 18, 1829 :—" You must be well aware that the principal source of danger attending the operation, or rather as a consequence of it, is the opening the sac, and thereby laying bare the peritoneal cavity of the abdomen. . . . Cases will occasionally present themselves in which the operation is not practicable ; or if it can be performed, from the nature of circumstances attending it, will fail to relieve strangulation ;" and into these circumstances he subsequently entered at length. In a second case, he made a similar attempt, but was equally unsuccessful, owing to the peculiarities of the case. These facts are mentioned to illustrate the perseverance with which Mr. Key carried out his convictions in reference to this operation ; for at the same time, M. Dupuytren was arraigning a formidable mass of evidence against it in Paris,* and Messrs. Liston and Lizars were discountenancing it by their practice in Edinburgh.†

Following this outline chronologically, I find that, in 1831, Sir Charles Bell recanted the unfavourable opinion of this operation which he had previously formed,‡ and directed after a preliminary incision made over the neck of the tumour, that the division of the seat of stricture should be made external to the sac ; " that failing in this manner to relieve the gut, you puncture the sac near the stricture, introduce your director, and divide the sharp edge of the stricture from within." § . . . It does not appear, however, that Sir Charles afterwards practised this operation.* In this year Mr. Luke operated at the London Hospital also in a case of strangulated hernia external to the sac; but, to relieve the parts, he found it necessary afterwards to lay it open.

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* " For some time it has been thought that strangulation, in all cases of inguinal hernia, was due to a constriction exercised by the *ring* upon the intestine. This erroneous view has more than once been followed by fatal consequences ; for upon this false principle surgeons divided the inguinal ring freely, and returned the parts into the abdomen, under the impression, that they had dilated the stricture ; but the bad symptoms continued, rapidly increased, and the patients sunk, without any one being able to render an account of the true cause of death . . . . I believe now to be able to show that in nine cases of strangulation, there are eight which result from constriction *by* the neck of the sac . . . . These observations apply especially to inguinal hernia ; for that disposition is found to be proportionally somewhat *less frequent in* crural and umbilical hernia." —(Léçons Orales de Cliniques Chirurgicale, tome premier, p. 275.)

† Edinburgh Hospital Reports, Medical Gazette, p. 508.

‡ See Lancet, vol. xii. p. 548.

§ Medical Gazette, vol. v. p. 680.

Mr. Bransby Cooper, in 1833, detailed a case of femoral hernia, in which he operated successfully without opening the sac; and says, in reference to it, that in consequence of the discovery of the transversalis fascia and of the arrangement of the fibres of the transversalis muscle, by Sir A. Cooper, "This plan may be adopted upon *principle;* as it is proved that the real seat of stricture is much more frequently dependent upon them, than upon the hernial sac." †

In the same year Mr. Key brought the operation more prominently before the profession, in a monograph, "in the hope of making its advantages generally known, and, probably, more generally adopted."‡

Mr. Key deduces from the report books of Guy's Hospital, and from Mr. Nunneley's private note-book, that "the majority of the cases (in which death ensued) have died from peritoneal inflammation consequent upon the exposure of an inflamed or strangulated portion of bowel;" and after referring the condition to the circumstances attendant upon opening the sac and exposure of its contents to different agencies, he makes the following important remark:—"In tracing the inflammation consequent upon an operation for hernia, it is found to spread from that portion of the bowel that has been strangulated over the peritoneal surface of the intestines, and not to have its origin from the incision in the sac, although two wounds are usually inflicted upon it; . . the peritoneum, about the seat of stricture, exhibits fewer signs of acute inflammation than the investment of the bowels" (p. 12). Mr. Key then cites some cases operated upon in the usual manner, for the purpose of showing that it is not necessary in every case to open the sac, in order to relieve the strangulated parts. "Such facts," he continues "with the inferences which they suggest, seem to call upon surgery for some mode of relieving hernia under strangulation, that shall not expose the patient to the same risk of inflammation as confessedly attends the present method of operating. The plan of dividing the stricture, without including the sac, or exposing its contents, seems to realise this object;" &c. pp. 28, 29 ‖

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* Medical Gazette, vol. x. p. 747, 748.

† Medical Gazette, vol. xiii. p. 395.

‡ A Memoir on the Advantages and Practicability of dividing the stricture in Strangulated Hernia on the outside of the Sac. By C. Aston Key, London, 1833.

‖ Mr. Lawrence does not coincide with Dr. Monro and Mr. Key in ascribing these pathological changes to the influence of air, light, and handling; but to "the pressure of the stricture, which affects the parts not

Amongst the advantages which Mr. Key attributes to this plan, are the less exposure of the vessels to danger, and the avoidance of hæmorrhage into the abdominal cavity in case an errant vessel should be wounded; the diminished risk of accidentally wounding the intestine by the knife, or what is comparatively of more frequent occurrence in femoral than in the other varieties of hernia, of rupturing a portion of the bowel that might have undergone the ulcerative process from the pressure of the constricting band, a result, which sometimes happens from drawing the bowel from under the stricture, in order more completely to bring it into view.* Again: collections of pus which have been found at the mouth of the sac, attended with intestinal irritation and peritonitis, are not so likely to occur if the sac be allowed to remain entire.

To the objections of Heister and Richter,† Mr. Key replied,—"The difficulty of the operation is much overrated; and at the present day, when anatomy is so thoroughly cultivated, and especially that of hernia, surely that which was effected by Monro, can be done by a surgeon who possesses advantages to which Monro was a stranger;" and further remarks,—"From the extent to which the stricture is usually divided, in order to return the contents of the sac, it may, perhaps, be imagined that a still more extensive division is required when the sac is not opened. . . The contrary, however, I believe to be the case. If the stricture is divided from within the sac, parts are incised that have really no share in constricting the hernia, as the sac itself and the cellular membrane that intervenes between the tendinous border forming the stricture and the neck of the sac" (p. 90). Adhesion of the intestine to the surface of the sac, the possibly gangrenous state of the saccular contents, and stricture by the neck of the sac, have been arrayed as objections; but these conditions of the hernial parts cannot be considered as *objections* to the operation under review, since they belong to a class of cases for which the mode of operating in question was never designed. In performing this operation Mr. Key uses a director of his own invention; in which "the blade is below the level of the handle, and is slightly

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like the slight violence of the operation, for a few minutes only, but uninterruptedly for hours, and sometimes days, disturbing the circulation, making an impression on the intestine as if it had been tied with a string, and sometimes causing ulceration either of the internal tunics, or of the bowel in its whole thickness."—(Op. cit. p. 280.

* M. Chevalier relates a case in the Med. Chir. Trans. vol. iv., in which the edge of Gimbernat's ligament exerted so much pressure on the protruded intestine as to lead to ulceration of its coats, and, after reduction, fatal effusion of its contents into the abdominal cavity. Dr. Breschet has instanced a similar case.

† Page 29, book 8.

curved, the extremity being flattened to enable it to pass with more facility under a firm stricture" (p. 134). The operation itself is conducted by Mr. K., as follows: —After making a single perpendicular or tranverse incision of the integuments and superficial fascia, the fascia propria is exposed, forming " the first distinct covering of the tumour, being darker than the more superficial cellular investment. It is under the outer layer of this fascia that the adipose stricture is formed, which often assumes the appearance of omentum. The director easily makes its way under this fatty matter, as far as the neck of the sac, which lies deeper than the operator at first supposes. The point of the director should be applied rather to the inner than to the outer part of the neck of the sac, as it will be found more easily to pass under the stricture at this part. . . The seat of stricture being felt, the operator should depress the end of the director upon the sac, which will yield before it, and then, by an onward movement, the director slides under the stricture " (p. 144).

Mr. Luke's advocacy of Petit's principle has received more support from the results of that gentleman's practice than from all the other arguments which have been adduced in its favour.* The plan of operation which Mr. L. now adopts is probably the most simple which has been advised; and to this, and to the singular facility with which, I am told, he executes it, the favourable results alluded to are probably to be attributed.† Mr. L.'s objection to laying open the sac, unless it is absolutely required, is so great, that he has suggested a mode of operating in those cases in which the stricture is in the neck of the sac, by which it may in many instances be adequately dilated, and yet the inner surface of the sac be permitted to remain entire:—" When the stricture is situated exteriorily to the sac, a director may generally be easily introduced under it, and it may be as easily divided with a bistoury; but when the neck of the sac itself forms the stricture, no such measure can be adopted. In such cases its division (dilatation) should be accomplished by cutting the indurated substance on its exterior surface only, taking the greatest care that the knife does not penetrate to the interior of the sac. . . . To render the relief effective, the partial division of the indurated neck should be repeated in one or two other situations on the circumference of the stricture, by which at length the stricturing substance is so far weakened in its power of resistance, especially when unsupported by surrounding structures, that it becomes susceptible of dilatation by the very moderate interior pressure of the hernial contents during the efforts of the taxis." *

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* See Table I.

† Mr. Luke has reduced the operation for femoral rupture to a simple and small longitudinal incision over the seat of stricture; and the subsequent division of the stricture with as little disturbance of the tissues as possible.—(See Abstract of Paper read before the Medico-Chir. Society, in Lancet for March, 1848.)

Mr. Lawrence most generally approves of the plan of opening the sac; but allows that the question of eligibility between the two modes "must be determined, like all other practical matters, by experience. Unless unequivocal advantage should be found in the latter (Petit's), I should not recommend its adoption, being unwilling to introduce, without absolute necessity, a new difficulty into an operation always requiring consideration and caution, and frequently attended with embarrassing circumstances." †

Petit's *method* of operating has been termed, "the *operation* without *opening the sac;*" and I have adopted the terms, because they have been sanctioned by usage. But as they involve the erroneous idea that it is *the* operation for herniæ indiscriminately, whilst it is but a modification adapted to a peculiar class of cases, their continued use is likely to mislead. The *principle* of this mode resolves itself into the practice of not carrying the incisions deeper, or wounding more structures in the course of an operation than are absolutely required for the liberation of the constricted parts. In many cases, the mere opening of the sac would be a matter of but little consequence; but in others, and probably in the greater number of cases, the strangulated parts are so injured at the time of operation, that the additional harm from exposure, &c., is all that is required to give them an unfavourable turn.

(35)—In 1841, M. Jules Guerin suggested a plan of sub-cutaneous operation, which he successfully adopted in a case of inguinal hernia. It consisted in first making two incisions through the skin at the root of the scrotum. A director is passed through one, and gently pushed into the inguinal canal between the seat of the stricture and the neck of the sac; whilst with a convex and blunt-pointed myotome passed through the other into the groove of the director, the division of the stricture is to be accomplished. ‡

The proceedings consequent upon opening the sac, when demanded by the condition of the parts within, it is not the purpose of the present treatise to enter upon.

(36)—There are no data upon which to establish a comparison between the results of ancient and modern practice in this department of surgery; but there is much reason to believe that in former times few survived the perils of a strangulated rupture, if for a moment we reflect upon the pains which were taken, and the cruel and barbarous practices which were resorted to, with the view of obviating its occurrence. Neither are we able to form a satisfactory estimate of the comparative advantages which either one of the methods of operating advocated in modern times possesses over the rest; for, in the majority of instances, cases and operations have been reported on account of some peculiarity which their history or progress might have exhibited; whilst ordinary cases, which for the purposes of an inquiry such as I am about to enter upon are of much greater value, have not been deemed worth recording. There are, however, exceptions to this remark; and these are furnished by some Statistical Tables of Mr. Luke, and the Records of Guy's Hospital, to which allusion will hereafter be made. Such materials as I can obtain, it will now be my purpose to analyse, in order to ascertain the rate and causes of mortality consequent upon hernial operations, and to see how far the plan of treatment which I am about to propose will be calculated to remedy them.

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* See an excellent Paper on Strangulated Hernia, by Mr. Luke, in Medical Gazette, vol. i. 1839-40; also another in the 26th No. of the Medico-Chir. Trans.

† Before the publication of Mr. Luke's statistical account of the results of this mode of operation, through a Paper recently read before the Medico-Chir. Society, it is due to Mr. Lawrence to state, that no "*unequivocal* advantages" had been shown to arise from the immunity of the sac from injury in hernial operations.

‡ Gazette Medicale, Aout, 4to. 1841; also Medical Gazette, vol. xxix. p. 95.

Mr. Pott, when speaking of operations for hernia, says, "That the operation considered simply is not void of hazard, every man who knows anything of the nature of wounds in membranous and tendinous parts, must acknowledge; . . . but that they are *necessarily*, or even *most frequently* hazardous, daily and manifold experience contradicts." * Mr. Hey and contemporaneous writers, however, speak less favourably; for instance, Sir A. Cooper says, "The operation, if well performed, in an otherwise healthy person, is attended with little danger, and it is therefore natural to inquire why it has *so frequently been followed by the death of the patient.*" †

Mr. Key commences his Memoir by lamenting "the fatality that often attends the usual mode of operating;" and adds, that "the danger attending the operation for strangulated hernia, the records of large hospitals, and the memoranda of private practice, if candidly stated, will abundantly testify" (p. 2). Of 80 reported cases collected by Mr. T. W. King, from the practice of Arnaud, Pott, Hey, Sir A. Cooper, Scarpa, Lawrence, Key, and others, in which the operation had been performed, 34 were unsuccessful. ‡ From the Appendix to the Reports of the Royal Infirmary of Edinburgh, compiled by Professor Reid and Dr. T. B. Peacock, it appears that out of 9 persons who were operated upon between the years 1839—43, 4 died. From

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* On Ruptures, p. 96.

† Op. cit. p. 35.

‡ Paper by Mr. Wilkinson King on Hernia, in Guy's Hospital Reports, October, 1838.

Reports by Mr. Howslip,* 11 died out of 19 persons operated upon. Mr. Anman collected together 545 cases, reported from the practices of many of the best European and Continental surgeons, of which number 260 perished.† In Paris, by a Report in the year 1843,‡ the average mortality after operation was in the ratio of 4 to 7; whilst at Wartzburg, 3 out of every 7 persons operated upon perished. In Mr. South's practice, whilst assistant-surgeon at St. Thomas's Hospital, out of 16 cases, 6 were unsuccessful. From the Report of cases admitted into Guy's Hospital, from September 1841, to December 1842, § after 19 operations, there were 9 recoveries and 10 deaths. In Mr. Luke's hands, however, the operation has been attended with unusual success; since out of 86 cases operated upon between the years 1831—41, only 19 died. ‖ It follows, from the *numbers* given, that out of 774 persons operated upon, 334 have died.

Since the principle of Petit's method of operation has been revived, a sensible diminution of the rate of mortality has taken place, as will be seen by reference to Table I. But it is obviously not fair to estimate this method by comparing the results of those cases in which it was adopted, with the results of others in which it became expedient to expose the contents of the sac; for the circumstances which would render the latter procedure necessary, would of themselves increase in every case the probability of an unfavourable issue:

TABLE I.

Whence obtained.	Total Number of Cases.	Sac opened.	Deaths.	Recoveries.	Sac not opened.	Deaths.	Recoveries.
Miscellaneous ………………………	57	48	25	23	9	2	7
Mr. Howship's Practice ¶ ……	8	6	3	3	2	2	—
Mr. Poland's Report of Cases in Guy's Hospital ** ………	17	12	7	5	5	2	3
Mr. Luke's ††…………………	82	25	8	17	57	7	50
St. George's Hospital, 1842-3 ‡‡	34	34	9	25	—	—	—
Total ……………	198	125	52	73	73	13	60

(37)—I shall now proceed to inquire into the *causes* of the high rate of mortality consequent upon hernial operations:

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* Discrimination and Appearance of Surgical Disease, by Mr. Howship, 1840.

† Edinburgh Medical Journal for 1845.

‡ Revue Med. Chir. de Paris, Jan.

§ Report by Mr. A. Poland, in 8th vol. of Guy's Hospital Reports.

‖ Report already referred to, Lancet, March, 1848.

¶ Op. cit.

** Reports, vol. i. 1843.

†† Lancet, March, 1848.

‡‡ Table of Cases, by Prescott Hewett, Esq., Lancet, 1844, vol. i. p. 290.

TABLE II.

PATHOLOGICAL CONDITIONS IN 52 CASES, AFTER OPERATIONS FOR STRANGULATED HERNIÆ.

No.	Pathologic Symptoms.	No. of Cases.	Period in Days between Strangulation and Operation.												Period in Days between Operation and Death.											
			1	2	3	4	5	6	7	8	9	10	11	Not mentioned.	1	2	3	4	5	6	7	8	9	10	11	Indefinite.
1	Peritonitis	8	1	1	2	1	...	...	...	...	...	...	1	2	3	4	...	1								
2	—— with portions of bowel sloughed, and adherent to ring. ...	2	...	...	...	1	...	...	...	...	...	...	1	......	...	...	1	...	...	...	...	...	...	...	2	
3	—— bowels matted together, with or without sero-purulent effusion, strangulated portion of gut, ruptured	3	1	...	...	...	...	...	...	...	...	...	...	2	1	1	...	...	...	...	...	...	...	...	1	
4	—— effused lymph and gangrene threatening	2	...	...	1	...	...	...	1	...	...	...	...	......	...	...	...	...	...	...	2					
5	—— bowel gangrenous	5	...	...	...	...	...	...	1	...	...	...	...	1	1	2	1	...	...	...	...	...	...	...	1	
6	—— gangrene and perforation, with or without escape of fæcal matter	9	5	...	1	1	1	...	...	...	...	...	...	1	3	4	...	1	1							
7	—— internal strangulation	2	1	1	...	...	...	...	...	...	...	...	...	......	...	...	...	...	1	1						
8	—— adhesions and internal strangulation	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	1			
9	—— with bowel still strangulated, and wholly gangrenous .	2	...	...	1	...	...	...	...	...	...	...	1	......	...	1	...	...	...	1						
10	——, artificial anus...	2	...	...	...	...	...	...	1	1	...	...	...	......	...	...	...	...	...	1	...	...	...	...	...	17 wks.
11	—— with pneumonia and pleurisy.........	2	...	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	1	1			
12	——, extensive ossification of arteries ...	2	1	...	...	...	...	...	...	...	...	...	...	1	2											
13	——, diseased heart, and sloughy external wound	1	...	...	1	...	...	...	...	...	...	...	...	......	...	...	1									
14	——, external wound sloughy	2	...	...	...	1	...	...	...	...	...	...	1	......	...	...	1	...	...	...	...	1				
15	External wound sloughy	1	...	1	...	...	...	...	...	...	...	...	...	......	...	...	...	...	...	1						
16	—— wound erysipelatous	1	...	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	1					
17	Pleurisy, with effusion and fungoid disease.	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	19 wks.
18	External wound sloughy, hypertrophied heart and artificial anus	2	...	1	...	...	1	...	...	...	...	...	...	......	...	1	...	...	...	...	...	...	...	...	...	6 wks.
19	—— wound gangrenous, and hypertrophied heart	1	...	...	1	...	...	...	...	...	...	...	...	......	...	...	...	...	1							
20	Pericarditis, with effusion, marks of old peritonitis; blood in pleura	1	...	1	...	...	...	...	...	...	...	...	...	......	...	1										
21	Exhaustion	3	2	...	...	...	...	...	...	...	...	...	...	1	2	1										

These pathologic changes may be resolved into 3 classes:

(*a*)—The 1st. to include those in which *the diseased processes were confined to the constricted viscera* . . . . 36 cases.

Of which symptoms of peritonitis alone existed in 8

Evidences of injury, more or less severe to the parts which had suffered strangulation, were observed in 23

The strangulated viscera were not liberated in 5

Of the 8 cases in which evidence of peritonitis alone remained after death, it is somewhat remarkable, that in 7, the fatal termination occurred either on the first or second day after the operation, although *the intestine had not been strangulated.*

In 3 cases, more than 1 day.
4 . . . . . . 2 days.
the other . . . 4 days.

In looking over the histories of these cases, there appears to be no evidence that peritonitis existed prior to the strangulation; nor in any case did the inflammatory action appear to have been so great as satisfactorily to account for the results. The experiments of Dr. Blundell prove that inflammation will supervene most rapidly, on injuries to the peritoneum, and destroy life in a very short period of time; but the destructive form of this affection is accompanied by local changes, which usually mark its progress,—such as the effusion of serum, or organizable lymph.* In the cases referred to, however, no such indications appear to have existed; and in three cases in the Table, in which death was naturally imputed to exhaustion, no traces whatever of disease were discovered.

I am therefore disposed to attribute the fatal result in all these cases to the depression of the vital powers, consequent upon a sudden and severe injury to the intestine; in short, to a *fatal collapse.* And this explanation is confirmed by the results of the experiments of Dr. Blundell, already alluded to; for all the rabbits, into whose peritoneal cavities irritant fluids were injected, suffered from, and some even died of collapse; in some of the latter, traces of severe peritonitis were discovered, whilst in others, the peritoneum was free from all visible evidences of disease. †

(*b*)—In the 23 cases in which peritonitis existed, but the fatal issue did not so speedily follow the infliction of the injury, the traces of this affection were evident in portions of the abdominal viscera which had not been involved; whilst the portion of bowel which had been strangulated showed still more important changes from a condition of capillary hyperæmia to gangrenous or other perforation of its walls. These changes are for the most part to be ascribed to the tightness of the stricture, and to the period of time it was permitted to exist; the strangulation had done its worst before the bowel was liberated; for in most of these cases the operation was deferred to a period of from 3 to 11 days. There were other cases, however, in which the intestine was found divided or ruptured, although strangulation had only existed 24 hours; in these instances the bowel was in all probability cut through either by the sharp edge of the constricting texture, or by the knife of the operator. Moreover, the class under review includes by far the larger number,—nearly one-half of all the cases which perish after hernial operations. It does happen occasionally, that the patient survives for a time, after perforation of the intestine by a gangrenous eschar, or even a separation of the whole of a strangulated knuckle has taken place. In these cases, adhesions become formed between the edges of the intestinal orifice and those of the crural ring; a fœcal abscess follows, if a sloughy state of the external wound should not occur to obviate its necessity, and an artificial outlet for the intestinal contents, formed in this manner, prolongs a miserable existence.

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* Pathological and Physiological Researches.

† Mr. Hey, in reference probably to cases of this class, says, "The complaint is sometimes, indeed, so rapid in its progress, that the patient is scarcely alarmed with his danger before the disease is irremediable."—(Op. cit. p. 106.) See Alison's Pathology, p. 12; and Travers on Constitutional Irritation.

In five other cases, although an effort had been made to liberate the strangulated intestine, it was unsuccessful; the parts having been returned into the abdominal cavity still incarcerated. In these cases, when the operation was performed early—on the 1st, 2nd, and 3rd day—the fatal termination did not take place until the 6th and 7th day; whilst in that instance in which the operation was deferred until the 11th day, death took place within two days after its performance. In each of the first cases, there was opportunity, and a fair chance of saving the patient's life by a second operation; whilst in the last case there could have been neither.

(*c*)—The 2nd class includes 8 cases, in which, together *with pathological changes in the strangulated parts, there were evidences of old disease in remote organs.* Table I., Nos. 11 to 14. Of the remote affections, those of the heart and arteries appear to be the most frequent and unfavourable complications of strangulated herniæ, and next those of the lungs or pleura. In each case death resulted early, although the operation was performed within a short period after the occurrence of strangulation; and it is to be observed, that the *local* evidences of inflammation in these cases were not such as to indicate a great or unusual amount of injury from the constriction. In all the instances in which an hypertrophied condition of the heart was the complication, the external wound became sloughy; and this circumstance, together with the often rapidly fatal termination of the cases, and the extreme depression of the vital powers that follows, should the issue be more protracted, leads to the inference that the risk of hernial operations is fearfully augmented by co-existent disease especially of the circulating or pulmonary organs. *

(*d*)—A 3rd class remains to be noticed, in which *the pathologic changes were found exclusively in parts and organs remote from the constricted viscera.* Table II., Nos. 15 to 20. In two of these cases these changes were confined to the external wound; whilst in the third, the wound became the seat of malignant growth, and the patient at last succumbed to pleuritic effusion. Erysipelatous and sloughy conditions of the external wound must be typical of the co-existence of a low and unfavourable condition of the vital powers generally; but in all probability the depression was rendered extreme by the shock which attended the act of strangulation. The morbid changes which the envelopes of a hernial tumour undergo, render their tissues prone to become the seats of unhealthy inflammatory action, and therefore less able to sustain those processes which are required for the reparation of those wounds and lacerations which are inflicted upon them in the course of an operation. In three other cases, in which the external wound became unhealthy, an hypertrophied state of the heart was found to co-exist; and in these the fatal event was singularly quick. In one of these, the peritoneal sac sloughed; and I am inclined to believe that this part of the hernial mass is especially liable to suffer from heart affections.

From these observations, I conclude,

1st. That strangulation of a portion of intestine can produce death, either by mechanical injury to the constricted viscera, or by the sudden depression of the vital powers, which is apt to follow so violent a shock. The probability of the latter result is proportionate to the systemic inertia; and the degree to which it might have been influenced by such agencies as age, disease, &c.

2nd. That in case strangulation is not suddenly fatal in the manner just referred to, it may destroy life by inducing a series of morbid changes in the constricted parts.

These results, however, depend upon—1st. the tightness of the stricture; 2nd. the length of time during which the constriction is continued, with other causes, into which I shall presently inquire; and 3rd. the co-existence of organic lesions in important organs.

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* Mr. Howship relates examples in his practice, in which the operation failed to save life, in consequence of disease of the arterial system; and also two cases in which alarming collapse, dependent upon the same cause, occurred during the performance of the operation. In a Paper in the Lancet for December, 1847, by the Author, are the following remarks:—" In cases of hernia the success of operations must depend mainly upon the co-existing state of the organs of the body in relation to health or disease;" and " the chances of success depend upon the relative importance of the affected organ in the maintenance of the vital functions generally."

(38)—The results of strangulation, referred to under the first of these heads, may be regarded as inevitable upon the act itself, and can therefore only admit, in each case, of a questionable amount of *relief;* whilst those under the second, are due to an aggravation of the lesion primarily inflicted, by influences to a certain degree under control, and are therefore, in the same degree, to be *prevented* as well as *relieved.*

What, then, are those influences which ordinarily affect the condition of a strangulated hernia, so as to conspire in furthering its fatal tendency?

(*a*)—Delay beyond the proper period for affording relief by operation. This conclusion has already been arrived at, but will receive further confirmation from the Tables which follow:

TABLE III.

DEATH, AFTER OPERATIONS IN 50 CASES.

No. of days between Strangulation and Operation.	Period of Survival in days.											
	1	2	3	4	5	6	7	8	9	10	11	Beyond.
1	5	2	...	...	1	1	1					
2	...	5	...	...	...	1	2	1	1	1		
3	1	1	1	...	1	...	1	1				
4	...	1	2									
5	1	3	1									
6	...	...	...	2	...	...	1					
7	1	2										
8	1	2	...	...	...	1						
9	...	...	...	...	...	...	...	...	...	...	1*	
10	2											
11	...	1	...	...	...	...	...	...	1			
12	...	1	...	...	...	...	...	...	...	...	...	1

An analysis of this Table shows the *immediately* fatal results of strangulation in a large proportion of cases; moreover, that the period of survival was on the average longer in those cases in which the operation was resorted to on the first, second, or

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* Fatal hæmorrhage from the spermatic artery occurred on the 8th day in this case.

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third day, than in others where it was deferred beyond that period. In seven instances, however, in which the operation was delayed, the periods of survival were as follows:

2 lived 4 days, the operation having been performed on the 6th day.
1 ,, 7 ,, ,, ,, ,, ,, 6th ,,
1 ,, 6 ,, ,, ,, ,, ,, 8th ,,
1 ,, 11 ,, ,, ,, ,, ,, 9th ,,
1 ,, 9 ,, ,, ,, ,, ,, 11th ,,
1 ,, exact period not defined, but beyond 12 days 12th ,,

It must therefore be allowed that the amount of risk incurred by delay varies in each case; but that beyond the 2nd day, it becomes extremely great.*

TABLE IV.

RESULTS OF DELAY IN 118 CASES.

Period between Strangulation and Operation in days.	Recoveries.	Deaths.
1	43	6
2	30	11
3	3	6
4	2	3
5	0	4
6	3	4
10	...	3

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* Sir A. Cooper suggested the 2nd day as the period beyond which delay becomes seriously hazardous; but, in accordance with the tabular results just given, that the condition of the patient and the tumour becomes a safer criterion: hence, that the operation should not be put off after "*soreness of the abdomen*" had set in. Mr. Lawrence says, "There is no single circumstance from which we can determine how long it may be safe to persevere in our attempts to procure a return of the rupture, and when the operation ought to be performed . . . Extension of inflammation over the cavity is generally indicated by tension and hardness of the belly, and pain on pressure. It is desirable to operate before these symptoms occur, especially the latter."—(Op. cit. p. 176.)

TABLE V.

OF 105 SUCCESSFUL OPERATIONS.

53	were performed on the	1st day	after strangulation.
30	„	2nd	„
6	„	3rd	„
5	„	4th	„
3	„	5th	„
6	„	6th	„
2	„	10th	„

According to the results of these Tables, the chance of recovery is in direct ratio with the shortness of time allowed to elapse between the occurrence of strangulation and its positive relief. Mr. King, in the article already referred to, informs us, that "in Paris, where the operation has been had recourse to immediately on the failure of the taxis, the success has been decidedly good; and occasionally, the same has been observed in England; but I am not informed of any conclusive records on this point." Probably one of the most interesting portions of Mr. Hey's experience refers especially to this point:—"When I first entered upon the profession of surgery, in the year 1759," says Mr. H., "the operation for the strangulated hernia had not been performed by any of the surgeons of Leeds. . . . We considered the operation as the last resource; and as improper until the danger appeared imminent. By this dilatory mode of practice, I lost three patients in five upon whom the operation was performed. Having more experience of the urgency of the disease, I made it my custom, when called to a patient who had laboured two or three days under the disease, to wait only about two hours. . . . In this mode of practice I lost about two patients in nine. . . . I have now, at the time of writing this, performed the operation forty times; and have often had occasion to lament that I had performed it too late, but never that I had performed it too soon." *

But although from the days of Pott and Hey, all authorities upon this subject have concurred in opinion as to the effects of unnecessarily temporizing in cases of strangulated hernia, and have not failed to denounce the practice as perilous in the extreme, deaths from delay in operating still swell the tables of mortality. † To what is this

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* Op. cit. p. 138.

† See the works of Callisen, Bertrand, Boyer, Pelletan, and others. In cases of *omental* hernia the operation should not be hastily proposed; not that the strangulation of a hernia of this kind does not require the same means for its relief, and the same rules in the adoption of them; but, as Mr. Key justly says, "it is not easy to distinguish between inflammation of omentum which has been irreducible and strangulation; for the

circumstance to be attributed? I am inclined to think, although Mr. Lawrence truly says "the danger to which the patient is exposed by the operation is less than that which he undergoes by delay," that a general impression prevails in favour of the reverse;—that it is better by any means to restore the rupture without, than to expose the patient to the *risk* of, an operation.

(*b*)—*The Taxis.*

It is difficult, and even impossible, to obtain any data upon which to calculate the proportion in the total number of deaths after strangulation, which is due to the operation of the manual attempts made to relieve it; or what share these efforts have in the production of the post mortem appearances in persons on whom the stricture has been relieved by the knife. From the general condemnation of the taxis, almost to proscription, there is every reason to apprehend that much of the fatality in hernia is to be ascribed to it.

Arnaud recites a case in which the taxis was succeeded by suppuration of the omentum.[*] Petit says, "Combien de fois a-t-on vu périr des malades le même jour que la réduction leur a été faité? à l'ouverture des cadavres, on a trouvé aux uns le boyau gangrène, aux autres il etoit crevé, et les matières fecales repandues dans le ventre."[†] Other instances are cited by Morand,[‡] Bell,[§] Sir A. Cooper,[‖] South,[¶] Teale,[**] and others; and it would appear from these that the pathologic indications of injury from taxis are peritonitis, gangrene, and rupture of the intestine. As taxis was employed more or less rigorously in the cases referred to in Table I., it is fair to assume that some of the lesions detailed as post mortem appearances were the results of its employment. "It has fallen to my lot," Mr. Key states, "to see more than one case in which the patient has fallen a victim to a long and continued succession of

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inflamed state of the omentum without strangulation, the operation will afford no relief; on the contrary, it will aggravate the inflammation. It is therefore highly advisable to try the effects of active general depletion, and the application of leeches to the part, under which treatment the symptoms will often disappear."—(Op. cit. p. 97.) Mr. Key adds, that operations on inflamed omental hernia are not only dangerous, but sometimes followed with fatal consequences. In cases of spasmodic and chronic strangulation less haste may be observed; and should a condition of collapse immediately follow the accident, it might be well to try whether the patient's condition be bettered for an operation by a little wine and the administration of appropriate stimuli; but in all other cases, and especially where the inflammatory action is severe, unnecessary delay is culpable.

[*] Mem. de Chir. tom. ii. p. 546.

[†] Op. cit. tom. ii. p. 328.

[‡] Opuscules de Chir. tom. ii. p. 160.

[§] System of Operative Surgery, vol. i. pl. 7 aud 11.

[‖] Op. cit. p. 23.

[¶] Chelius, vol. ii. p. 34.

[**] Op. cit. p. 96.

violent attempts with the taxis.* These are followed by a discharge of blood per anum from the bruised vessels of the lining membrane of the gut, which frequently exhausts the patient after the hernia has been returned."†

Mr. King has given a tabular view, from unpublished records, of 38 fatal cases of hernia, to illustrate the causes of death, &c.; from which I make the following extract, as it relates to the effects of taxis:

In 1	the hernia was	reduced by taxis;	death by peritonitis;	the gut red.
1	,,	,,	,,	; recovering.
1	,,	,,	sac and all, the structure remaining.	
6	,,	,,	but ruptured, death by peritonitis.	

Mr. King deduces that nearly one-fourth of the deaths by hernia follow the simple taxis. In one of these cases a reduction "en bloc" was effected by the taxis; and in another "was the same thing (but for the operation)." One patient died from rupture of the bowel, whilst in the other cases death seems to have resulted from peritonitis.‡

The rude employment of the taxis *during an operation* is, I believe, not unfrequently the cause of death. I have seen an instance of this kind; and am led to think that when the return of the bowel is not promoted by the division of the presumed seat of stricture, and the obstacles are not clear to the operator's mind, the return of the bowel by violence is often preferred to an abandonment of the operation.§ But in order to rescue the taxis from the opprobrium which its abuse has cast upon it, and to illustrate the advantages which accrue from its judicious employment, I have taken the liberty to construct the following table from Mr. Poland's Report of the cases which were treated in Guy's Hospital during the years 1841, 42:

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* Desault proscribed the use of the taxis in cases of strangulated hernia where inflammatory symptoms were present, until after their reduction by appropriate remedies; and this doctrine, taught by Scarpa (Traité des Hernies, p. 244—7), and more recently advocated by Mr. Guthrie (Op. cit. p. 23), appears to have become the rule of treatment. Moreover, the employment of this means is held to be more dangerous the longer the tumour has been strangulated.

† Op. cit. p. 35. Mr. Stanley has seen discharges of blood per anum, in cases in which the taxis alone was employed.—See Lancet, 1844, vol. 1, p. 290.

‡ It is to be regretted that in cadaveric inspections of cases of strangulated hernia attention has not been more generally paid to the lining membrane of the gut; it being most probable that the baneful results of violent taxis would show themselves principally in that structure.

§ There is no rule in connection with hernial operations of more practical importance that I know of than this. As their object is to effect what manual and other efforts could not, the liberation of the parts should be effected by the *operation*, and that alone; therefore at no one period, during its performance, should *force* be employed in order to procure reduction.

TABLE VI.

OPERATION OF REMEDIES, ESPECIALLY OF THE TAXIS.

	Age.	Variety.	Duration of incarceration or strangulation.	Means employed.						Results.	Termination.	Remarks.
				Taxis.	Warm Bath.	Enema.	Bleeding.	Ice.	Medicines.	Reduction effected.		
Strangulated.	38	scrotal	12 hours	—	—	—	……	—	……	reduced easily	death	slight peritonitis relieved by reduction.
	42	femoral	partly within 24 hours, and the rest 9 days	—	—	—	……	—	……	reduced	recovered	
	63	scrotal	10 hours	—	…	…	……	—	calomel and op.	reduced with difficulty	——	
	36	——	19 hours	—	—	…	……	—	……	reduced easily	——	
	36	femoral	5 days	—	…	—	……	—	……	returned	——	
Incarcerated.	30	scrotal	"a few hours"	—	—	…	……	—	……	———	——	
	43	femoral	24 hours	—	…	…	……	—	——	partially reduced	——	
	77	scrotal	2 days	—	…	…	……	…	……	returned at last	——	"long and frequent attempts were made unsuccessfully to reduce it."
	27	——	26 hours	—	—	…	……	—	……	reduced without difficulty	——	
	33	femoral	6 weeks	—	—	…	……	—	……	partly returned	——	"by moderate use of the taxis."
	40	scrotal	"a few hours"	—	—	…	……	…	……	returned with great ease	——	
	48	femoral	24 hours	—	…	—	……	…	……	soon returned	——	tenderness before reduction.
	65	——	6 hours	—	—	…	……	…	aperients	returned	——	
	15	scrotal	"a few hours"	—	…	…	to syncope	…	……	returned without difficulty	——	case of inflammatory hernia.
	35	——	———	…	—	…	……	…	……	"went up" in the bath	——	
	45	omental	9 days	…	…	…	leeches and venesection	…	……	partially reduced	——	tumour hard and tense, without tenderness; after first attempts became tender and was relieved by bleeding.
	61	scrotal	"a few hours"	—	—	…	……	…	……	returned	——	
	35	——	24 hours	—	—	…	……	—	……	"went up"	——	
	29	——	11 days	—	—	…	……	—	——	partially reduced	——	tenderness succeeded the first attempts.

This Table is an abundant plea for its employment where there are no symptoms of inflammation or other circumstances to interdict it. The question, however, occurs in reference to the taxis, as on a former occasion in reference to delay—why, after the oft-repeated cautions against the contrary mode of its employment, is its use not more constantly limited to the most gentle, and always more successful kind of pressure ? *

(*c*)—*Bleeding.* Although it may be open to dispute, whether blood-letting can be said to have ever been productive of *fatal* consequences in cases of strangulated hernia, there can be no doubt, from the inferences deducible from the pathology of this affection, that the rule of indiscriminately resorting to this practice is physiologically untenable. It might also be averred that in many cases it would, if employed in the earliest stage, conspire fatally to depress the patient, or seriously to aggravate those morbid processes which in the end insure their equally fatal although more gradual termination.†

(*d*)—The use of *tobacco infusion* or *smoke* as enemata, appears to be almost exploded. Tobacco has proved eminently successful when used to promote the return of strangulated hernia ; but its effects are not only of the most dangerous kind, but uncertain.

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* Sir A. Cooper advised that the degree of force should be but moderate, as the chief dependence should be placed on the *continuance*, rather than the *violence*, of the pressure. In accordance with this view, Mr. Wilmer proposed to make pressure by means of a weight moderately heavy, which was to be kept on the part for several hours.—(Practical Observations on Hernia, second edition, cases first and second.) In these two cases the plan succeeded ; but it is open to this objection, that unless the pressure be made first backwards, and then upwards—the direction that the hernia takes—the side of the tumour will be thrust and kept against the cutting edge of the stricture. This no force but that which the hands direct, can accomplish.

† Mr. Hey,—after summing up Mr. Pott's opinion, that bleeding ought never to be omitted in these affections, "if there are no particular circumstances in the constitution prohibiting it ;" Mr. Bell's, that "in no disease is it more indicated from appearances, or affords more relief in reality ;" Mr. Wilmer's and Mr. Alanson's, on the contrary, that "as the death of the patient can only be explained by the inverted peristaltic motion lessening the powers of life, that large and repeated bleedings must increase the debility and do much mischief,"—concludes, "that bleeding has generally failed to procure a reduction of the strangulated intestine ; though I am persuaded in many cases it may be used with advantage."—(Op. cit. p. 111, 12.

I believe that venesection is calculated to promote a fatal tendency in those cases in which depression of the vital powers ensues upon strangulation, and also in those in which the patient is at the same time suffering from some affection of one or more of the remote organs of the vital functions ; that it is useless where general laxity of fibre and a moderate or feeble pulse shows that further relaxation, if needed, can be obtained by the employment of other and less permanently depressing agents ; but that it is most judicious in those cases in which symptoms of local inflammation run high, and in which systemic plethora and a bounding pulse indicate that these conditions must be lessened, before other means can be efficaciously adopted.

The argument *for* bleeding, urged by Warner, Le Dran, and Mr. Hey, and still maintained by Mr. Lawrence ; viz., that after death from stangulated hernia "we almost invariably find unequivocal evidences of peritonitis, or enteritis ; and the symptoms, supervening on operations, which we find it most difficult to combat, are of the same character," is unsound ; for the products of inflammatory action are *generally* the greatest, and the affection itself most extensive and severe in those individuals who are, from constitutional causes, not fit subjects for great losses of blood. Mr. Macilwain says "that no persons have been more largely

Sir A. Cooper records two instances in which its administration proved fatal—in one, although only a drachm of the leaf was used.* Desault † and Velpeau ‡ relate similar instances; and Mr. Bransby Cooper mentions a case of a man who died in twenty-five minutes after an infusion of half a drachm had been used as an enema.§ The proportion of deaths from this agent cannot be ascertained; but from the results of private testimony, it is propable that they have been numerous. ‖

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bled, both for the reduction of the hernia, and again for that of subsequent peritonitis, than those who have died of this complaint;" and considers that its effect is to replace circumscribed by diffused inflammation of the peritoneal membrane.—See a series of good practical papers by Mr. M. in the Lancet for 1845.

Sir A. Cooper was a strenuous advocate of venesection, in order to produce a relaxation of the stricture, and to prevent the occurrence or increase of local inflammation; and recommended that it should be carried so far as to induce syncope. This author did not consider "the small thready pulse" of a person suffering under strangulated hernia, as a reason for not withholding the use of the lancet, "as the pulse becomes larger and fuller after this evacuation."—(Op. cit. p. 32.) But, as Mr. Teale observes, *this* pulse is to be carefully distinguished from the "rapid, feeble, and scarcely perceptible pulse, vanishing under slight pressure of the finger, which is the precursor of dissolution."—(Op. cit. p. 103.)

* Op. cit. p. 33.

† Œuvres, tome ii. p. 344.

‡ Nouveaux Elem. de Med. Op. tome ii. p. 352.

§ Medical Gazette, vol. xxi. p. 111.

‖ Mr. Hey states, "I think I may venture to say, that no method has succeeded so often, and that I have scarcely ever seen any other remedy succeed without the operation when this had failed of procuring an evident diminution at least of the tumour. One thing must be allowed of this remedy, that it discovers in a shorter time than any other, whether there is a probability of obtaining a reduction of the hernia without the operation" (p. 127). Mr. Key employs it "with the precaution of proportioning the quantity injected to the age and constitution of my patient" (p. 33, note). Of twenty-six cases in the experience of Mr. Velpeau, it was successful in one only.—(Op. cit. tom. ii. p. 352.) In a patient of Mr. Pott's, this remedy succeeded after he had been placed upon the operating table.—(Op. cit. vol. iii. p. 227.) Mr. Lawrence instances three cases; in the first of which, after five days' strangulation, the use of tobacco smoke, persevered in for a considerable time, procured the spontaneous reduction of the hernia. In the second, strangulation had lasted a week; the patient was reduced to a condition of the greatest danger, when the tobacco produced its beneficial effects, and he recovered. In the third, strangulation had existed three days; the tobacco was given, and it produced such a state of tremor and faintness as to make the attendants think the patient was dying; under these circumstances, the stricture gave way, and the patient ultimately recovered. Mr. Lawrence thinks it more objectionable than bleeding, and less so in large and old herniæ, than in small and recent ruptures accompanied with symptoms of great constitutional depression.—(Op. cit. p. 165.) It ought always to be resorted to when other means fail, and the patient refuses to submit to operation. Mr. S. Cooper relates the case of a woman in the University College Hospital, who would not submit to the operation, although other means had failed and this appeared to hold out the only chance of recovery. The tobacco injection was given, the strangulated parts were returned, and she recovered.—(Surgical Dictionary, p. 719.)

The *depressing* influences of tobacco appear to be the principal source of danger attending its administration: as a *relaxing* agent, therefore, it must yield to chloroform or ether when inhaled; for whilst these have an equally relaxing influence with tobacco, especially on the muscular system, they do not to the same degree depress the vital powers. Where diseases of important organs exist, such as of the heart or lungs, the effects of the latter agents, as shown by Mr. Thomas Wakley, in a paper in the Lancet, for January 1848, are (*e*)—The use of the *warm bath, ice, warm applications, cupping glasses, opiate, and other medicines*, cannot be said directly to have caused death in any instance; but by unduly occupying time, and thus prolonging the period before the operation is had recourse to, their employment may sometimes indirectly occasion fatal consequences.*

(*f*)—The *operation*, as usually practised, is another, and probably not an infrequent cause of death. By reference to Table I., it will be seen that its modification by Petit lessened the rate of mortality, and by observing the results of Mr. Luke's practice, the good results of its further simplification (34) will be self-evident.

The operation may prove fatal by *inducing unhealthy processes in the external wound.* In nine cases reported in Table II., the external wound became sloughy, erysipelatous or fungoid; in two it was accompanied with local peritonitis; in four with hypertrophy of the heart; and in a fifth with pericarditis and hæmorrhage into the pleura. In two cases the operation was performed on the day succeeding the strangulation; the patients sank on the sixth and seventh day, and yet there were no symptoms of disease in the strangulated parts.

In the other cases, the operations were performed on the 2nd, 3rd, and 5th days respectively; and the patients lived,—two until the 2nd; two until the 3rd; two others until the 5th, and 8th days;—whilst one, with an artificial anus, survived the operation many weeks. In the case of fungoid disease, the fatal issue was also protracted. In those cases, however, in which the local disease was complicated with lesions of the circulating and pulmonary organs, death supervened in the majority of instances on the 2nd and 3rd days.

The operation is sometimes fatal *by the accidental wounding of the contents of the sac.* Here, again, public records are not so redundant with information as they might be. There have been instances in which the extreme difficulty in distinguishing the various layers, from the unlooked-for and occasionally unique alterations of their tissues, from their irregular combinations, and from other changes which are liable to affect them, practised surgeons have been led to commit the fatal error of taking

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uncertain and dangerous; but the same remark applies to tobacco. A case is recorded by Mr. Davison, in the first vol. of the Lancet, for 1848, in which the hernia was reduced whilst the patient was under the influence of chloroform. The vapour of ether or chloroform should be the last in the series of remedies prior to the operation, so that the operation, should it still be necessary, might be performed whilst the patient is under its influence.

* The author is by no means hostile to the proper use of these means. They are most serviceable, and often successful (see Table VI.), especially the warm bath, ice, and opiates; but as there is a tendency to place confidence on a particular plan or mode of using one or more of these remedies, so there is much reason for caution lest unsuccessful perseverance should add other victims to the evils of fatal delay.

the intestine for the sac. This and the difficulty of identifying the various components of a hernial tumour, (for no two herniæ are alike,) which is necessary in order to execute the ordinary operation, are grave charges against it, and constitute that source of apprehension to which, in many instances, fatal delay in its execution is to be traced. *

The *operation* is also occasionally fatal *from the wounds of arterial branches which may happen to be in juxta-position to the seat of stricture.* The mortality from this source is comparatively small; nor can such accidents always be avoided (33 *g*).†

(*g*)—*Age* has an unquestionable influence upon the rate of mortality after hernial operations.

TABLE VII.

INFLUENCE OF AGE UPON OPERATIONS.

Ages.	Relative frequency of Hernia at these periods.‡	Total No. operated upon.	Relative No.	Recoveries.	Deaths.	Proportion of Recoveries.
Between 1 & 10 yrs.	7,229	1	......	1		
10 20	4,551	1	......	1		
20 30	8,715	11	1 in 800	7		1 in 75
30 40	13,614	11	1 1237	6		1 2
40 50	15,627	24	1 651	13	11	1 18
50 60	14,169	33	1 429	19	14	1 35
60 70	9,761	18	1 542	9	9	equal
70 80	3,866	5	1 775	3	2	1 5
80 90	442	6	1 73	4	2	2
90 100	23					

From this Table, it appears that the relative number of operations to the number of persons afflicted with hernia is greatest at the 9th decennial period, and least at the 4th; whilst the mortality is at its maximum at the 7th, and at its minimum at the 9th; so that between the ages of 80 and 90, with the largest proportion of operations, there is also the largest proportion of recoveries. The total number of cases subjected to operations increases from the 2nd decennial period to the 6th, and then declines.

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* In 1825 the operation for hernia usually occupied from a quarter to half an hour.—(See Lancet, vol. vi. p. 38.)

† The wounds of the obturator, epigastric, or spermatic arteries, may generally be remedied by pressure; or if that is insufficient, by ligature.

‡ Report of the City of London Truss Society. This Report so nearly agrees with that of the Registrar-General, that I have not thought it necessary to quote from the latter.

From these statements and reflections, I am led to conclude that death, in cases of strangulated hernia, is caused either *directly* or *indirectly.*

1st. Directly; by,

(*a*)—The shock of the accident (37 *a*), in the ratio of about 1 to 5.

(*b*)—The lesions, physical or organic, which the strangulated parts sustain (37 *b*), in the ratio of about 1 to 2½.

2nd. Indirectly; by,

(*c*)—Trusses or other compression, which have the effect of thickening the neck of the sac, without obliterating its orifice (34).

(*d*)—Delay in affording relief by operation (38 *a*).

(*e*)—The injudicious use of the taxis (38 *b*).

(*f*)— ,, bloodletting (38 *c*).

(*g*)— ,, administration of tobacco (38 *d*).

(*h*)—The simultaneous existence of diseases in remote organs (37 *e*).

(*i*)—The operation (38 *f*).

The indications of treatment which these results afford are briefly as follows:

(*a*)—Stimuli, and immediate relief; the latter by operation, if the remedies should not succeed in rousing the exhausted powers.

(*b*, and *h*)—The early relief of the strangulated parts by operation, as soon as the judicious use of the preliminary means shall have proved unavailing.

(*c*)—The avoidance of all unnecessary pressure on the hernial sac.

(*d*)—The judicious choice of a *few* preliminary measures, their moderate employment, and non-repetition.

(*e*)—The most gentle handling of the parts on all occasions.

(*f*)—The avoidance of bloodletting in all but those cases in which it is manifestly demanded.

(*g*)—The abandonment of this remedy in every case where the operation will be submitted to.

(*h*)—A more simple operation.

THE OPERATION.

(39)—The reader will have seen, in sections (34, 38 *f*,) an account of the operation as it is usually performed, and the objections to which it is open. The principle of that which I now propose to substitute for it, is non-interference with the hernial tumour. The incision, by which the seat of stricture is to be reached, is made at the farthest possible distance from the protrusion, and through tissues free from the results of morbid change. It is adapted to all cases where the seat of stricture is external to the sac; and it is to be hoped that by the observance of adequate care in the mechanical treatment of reducible herniæ, that those changes in the neck of the sac will become less frequent, which render necessary the severer and more fatal operation of exposing its contents (34). Since, however, the precise seat of the stricture cannot be determined prior to operation, the operation which I propose should be performed in every case; for it would be easy to extend the incision across the hernial tumour, or in any direction that the operator might choose, for the purpose of opening the sac, should the seat of stricture or other causes of obstruction prove to be either in the neck of the sac itself, or amongst its contents.

" Incarceratio nulli remedio cedens, sectione tollenda." The patient having been prepared, and the vapour of ether or chloroform having been administered,—where the use of these remedies is not forbidden by any circumstances in connection with the patient's previous state of health,—the taxis might be gently used whilst the patient is under its influence. For the first step of the operation, two imaginary lines should be drawn *from the point directly over the* inner side of the neck of the hernial tumour; one to the tuberosity of the pubis; the other down the thigh along the inner side of the tumour. These two supposed lines will include an angular space, in which, and about mid-distance from either, the *first incision* is to be made. This incision should commence just within the angle formed by the meeting of these lines, and be carried inwards and rather downwards, for the extent of an inch or little more; and should divide the integuments and superficial fascia over the *femoral fossa* (22 *c*). (See its form, direction, and relations, as indicated by the line *e*, in Plate 3, fig. 2, as well as by the white line in Plate 1.)

For the second part of the operation, the forefinger of the left hand (if the hernial tumour is on the right thigh, and *vice versâ*) is to be passed through this wound, upwards and outwards, along and close to the side of the hernial tumour, to its neck.—Should any of the deep laminæ of the superficial fascia which occupy the femoral fossa (9 *c*) obstruct its passage, these must be divided.

The blunt point of a bistoury caché, guided by the tip of the finger still in the wound, is to be passed *through* the cribriform fascia (one of the sheath-like apertures in which it will readily enter), and the delicate *vaginal sheath* which alone intervenes between it and the crural canal. It is now to be directed upward, through the *canal,* to the *ring,* where it usually meets with resistance from the seat of stricture. By the least amount of force, and with the aid of a little gentle compression of the inner side of the tumour by the finger, the point of the bistoury may be insinuated between the *sac* and the pubic margin of the *ring:* the edge of the knife is then to be turned towards the pubes, and, by projecting the blade, the seat of stricture in that direction may be effectively divided.* Should the surgeon, however, be disposed to direct his incision forwards, it may be done either before or after the incision of Gimbernat's ligament with equal facility (see Case 5). It will be obvious, from a reference to the anatomical relations of the parts, that in its course from the femoral fossa through the cribriform fascia, crural canal, and ring, the knife will pass successively behind the falciform process, the edge of the lower orifice of the canal, Hey's ligament, and the fibres of the inguinal ligament of Hesselbach; and thus be made to command whichever may happen to be the particular seat of stricture (see Plate 2). By taking care not to keep the knife too close to the side of the hernial tumour, after its point has passed the cribriform fascia, its point would glide between the sheath and the deep layer of the iliac fascia lata (11 *e, f*); and in this way it would pass *between* the *ring* and the *last portion of Hey's* and *Gimbernat's ligaments,* and thus a division of these structures might be effected from the *outside* of the sheath or canal.

If, after the division of the ring and parts on its pubic and front sides, the hernial tumour is not to be replaced without the employment of force, the stricture cannot have been dilated; and the surgeon would then have to contemplate the possibility of its being situated in the fibres of the septum crurale (19 *d*, 27). The still constricted neck of the sac would in that case be felt, and it would be for the surgeon to get his knife cautiously behind the constricting fibres. This could be most easily done by such a knife as that I am in the habit of using,†—which has a beak flattened in the direction transverse to the edge,—by gently pressing the side of the tumour outwards immediately below the seat of constriction, so as to gain room for its introduction.

Should the seat of stricture be in the margins of one of the apertures of the cribriform fascia (14 *e*), which would in all probability be discovered at an early period of the operation, the means for dilating it would be analagous to those which have just been detailed.

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* The objection urged against the division of the stricture towards the pubis, on account of the depth from the surface, at which it has to be made, cannot apply to this, as it assuredly does to the usual, method of operating; since the portion of the stricture selected lies immediately beneath the *undisturbed skin*, S. fascia, and crural arch.

† Made by Ferguson.

If, after the division of these various textures external to the sac, the hernial tumour should still remain constricted, the external wound would have to be enlarged, and the seat of stricture looked for either in the neck of the sac, or within the sac and amongst its contents.

The operation just detailed is most simple and easy of execution; requires but few, and those small incisions; leaves the hernial tumour and its diseased coverings untouched; permits, if necessary, the immediate use of a truss; and, in an otherwise healthy subject, requires but a few days for the perfect recovery of the patient (see Case 5).

A single attentive examination of the parts in the dead subject, is sufficient to ensure competence in the performance of this operation; and it is not too much to expect, should it meet with a favourable reception on the part of my professional brethren, that, by its being made to supersede the practice of injuriously employing those various remedies which usually precede the use of the knife, and by its being almost free from the danger which attends the old operation, it will tend materially to lessen the mortality which at present prevails in this class of diseases.

CASES.

Case 1.—Sept. 18, 1847. Mrs. B., æt. 67. I saw this patient with Mr. Dempsey, of Wilderness-row. She had been ruptured for twenty-five years, and, from the ease with which she returned it when down, had become negligent in wearing her truss. After three days' constipation, on leaving off her truss, the hernia came down, and was irreducible. She had, when I saw her, abdominal tenderness and stercoracious vomiting, a dry and furred tongue, and a languid and quick pulse; but no distinguishable lesion of heart or lungs. In the presence of Mr. Dempsey, and Mr. Hole of Tetbury, I performed the operation, by making the external incision as recommended above, and dividing the stricture towards the pubis. The tumour was easily returned, the symptoms disappeared, and in one week, the small wound was healed; but the patient had resumed her household duties for several days before.

Case 2.—December 30, 1847. Mrs. M., æt. 52, was admitted into the Royal Free Hospital, with a strangulated femoral rupture on the left side. This patient was fat, and her flesh pale and flabby. The heart's sounds were dull, pulse weak, the hernial tumour large. The rupture had occasionally protruded for the last three years: but this morning, after an effort, the descent again took place, and she was unable, as on former occasions, to return it. I saw her in the evening; and after the unsuccessful use of the warm bath, &c., I performed the operation, in the manner described, in the presence of Mr. Coulson, Mr. Thomas Wakley, and Mr. Cooke, whilst the patient was under the partial influence of chloroform. The time occupied in the operation did not exceed a minute. The slight pressure to return it was made upon the sound skin covering the tumour, as in all these operations; and the patient left the hospital in a fortnight. The wound did not heal readily, but this was accounted for by the condition of her general health.

Case 3.—Mrs. D——, æt. 68. I was requested by Dr. Catherwood, of Charles-square, Hoxton, to see this patient, on the 16th of April. She had been subject to hernia for eight years. The protrusion took place four days before, on the right side. Vomitting commenced the previous night, and she was suffering from excessive pain, increased, on pressure, on the right side of the abdomen. The bowels had not been opened since the 12th; the pulse was 70, and firm; the heart's action and sounds were normal; there was slight bronchitis. I returned the protruded parts without opening the sac, after dividing the edge of the pubic portion of the fascia lata which goes to form the saphenous opening, as well as Gimbernat's ligament; both of which, in their respective situations, firmly constricted the hernial sac.

April 17th.—Tongue white and furred; considerable burning pain in the lumbar region; increased difficulty of breathing, with other symptoms of aggravated bronchitis. Dr. Catherwood most judiciously took six ounces of blood from her arm, with great relief to her symptoms, and treated her in other respects. The bowels had not been opened, although an aperient draught, with saline medicines, had been given.

18th.—Pulse 80, with power. By an enema, and the repeated use of saline aperient medicines, the bowels have been freely relieved to-day; there is less tenderness and pain in the abdomen; she is better in all respects.

20th.—She was unable last evening to pass her water. The catheter drew off a considerable quantity, highly ammoniacal. The bowels are only opened as she takes castor oil or other aperient, and on each occasion, the evacuation is preceded by severe pain in the right lumbar fossa; tongue furred and brown.

21st.—She is able to pass her urine; complains of severe pain, increased by pressure on the left side of the abdomen, just below the edge of the ribs; pulse 88, full; tongue browner and more furred. Twelve leeches to be applied to the seat of pain, and hot fomentations. Continue aperient medicines, with one-sixth of a grain of the potassio-tartrate of antimony every four hours.

22nd.—She passed a restless night. This morning a very large quantity of dark, fœtid, fæcal matter, passed from the bowels, with relief to all the symptoms; tongue still furred. Continue aperient medicines. Chloride of mercury, five grains, immediately. Large quantities of unhealthy, fæcal matter, were afterwards evacuated, and the patient recovered.

On the 29th the wound was healed.

Case 4. June 30.—Miss M., æt. 52. I saw this patient, at the request of Dr. Conquest. She had suffered for years from femoral rupture of the left side. Three days since it descended, abdominal uneasiness followed; and it was not until she consulted Dr. Conquest that her attention was directed to the right source of her suffering. As her symptoms became rapidly more urgent, I operated three hours after my first seeing her.

The stricture was divided towards the pubis: the wound healed rapidly, and in one week the patient had recovered.

Case 5. "Miss M., æt. 29, had been subject to femoral rupture on the right side, for twelve years, but had not worn a truss; for whenever a protrusion took place, she was able, without difficulty, to return it.*

August 12th.—After some exertion, the rupture descended, and could not be returned. I saw her in the afternoon, and found it reducible by taxis; although aided by bleeding, the application of ice, and a purgative enema. Vomiting supervened, and continued with scarcely any intermission during the whole night; and the lower part of the abdomen, especially on the right side of the linea alba, became tense and painful.

13th.—A little before eight o'clock in the morning I again visited my patient, and found the symptoms so extremely urgent that I immediately determined on operating, and adopted the plan recommended by Mr. Gay, described by Mr. Coulson at the Medico-Chirurgical Society, and reported in the Lancet of March 18th last (p. 308).

Mr. Gay saw my patient; and with his kind assistance (Mr. Burchell being also present) I began the operation, after chloroform had been exhibited, by making an incision, about an inch in length, between the tumour and the spine of the pubis, obliquely, from above downwards, and from without inwards, the highest point of the incision being over the inner part of the femoral ring. After completely dividing the superficial fascia, the tip of the finger was readily passed to the angle between Gimbernat's ligament and the neck of the hernial tumour, and a section of the edge of the ligament made with a concealed bistoury. A few fibres were now found to hold the tumour, which were divided by bringing the edge of the bistoury directly forwards. By making a very gentle pressure on the sound skin, the rupture immediately returned. The whole operation occupied but a very short space of time: within ten minutes the bowels were moved, and their action continued at short intervals during the course of the night.

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* Lancet, August 26, 1848, by A. Catherwood, M.D., Hoxton.—The wound in this patient was perfectly healed in one week.

14th.—Slight pain in the right side of the chest; abdominal pain nearly gone. She wishes to get up. Ordered, half an ounce of castor oil, to be taken directly, and when it has acted, twenty drops of laudanum every three hours, until the action of the bowels be restrained. Beef-tea.

15th.—Pain recovered; the slight wound healing fast.

Observations.—This mode of operating possesses such great advantages over the commonly-adopted method, that it only requires to be thoroughly known and understood, to receive the sanction of the profession.

1. The external incision is only just large enough to admit easily the fore-finger.
2. Healthy structures are alone interfered with.
3. The wound heals by the first intention.
4. A truss may be worn three days after the operation.
5. The pain is inconsiderable, and the danger most materially lessened.

The application of this principle to other forms of hernia.

I. *Inguinal.*

Case 6. (*a*)—In the month of March, Mr. Coulson, who has taken deep interest in the object of the present treatise, requested me to accompany him and Mr. Childs to see a case of strangulated inguinal hernia, under the care of Mr. Price, of Stamford Hill. The patient was a corpulent lady, somewhat above the age of forty; and the rupture was on the right side. An operation being indispensable, Mr. Coulson performed it as follows, with the utmost success:—An incision of about an inch in length was made *transversely* through the abdominal integuments, over the upper margin of the external ring, and clear of the hernial protrusion. Having next cleared the way to the ring by the division of a little subcutaneous cellular tissue, a bistoury caché was inserted readily into the inguinal canal, between the edge of the stricture and the sac, and the stricture was divided. The recovery was rapid, and most satisfactory.

II. *Umbilical.*

(*b*)—The adaptation of the principle advocated, to this form of rupture, reduces the usually serious operation to one of small magnitude and comparatively harmless. A small incision should be made through the integuments and superficial fascia, *clear*, of the *tumour*, and in the direction *across* the linea alba, either on the sternal or pubic side of the tumour, but as near to the umbilicus as it can be made consistently with carrying out the other parts of the plan.

This incision will lay open the triangular sinus which the tumour forms, by raising the integuments from the abdominal parietes close to, and around, its edge. The cellular tissue should be divided so as to permit the finger and bistoury caché to pass to the linea alba, and along it to the edge of the ring. The beak of the bistoury will now be easily insinuated between the neck of the hernial sac and the seat of stricture,—the margin of the ring; and the latter divided outwards from the tumour.

Sir A. Cooper operated in two cases in a manner very similar; but his incision was *parallel* to the linea alba, and encroached slightly upon the skin covering the tumour. This plan was successful in the cases referred to, and in this respect contrasted strongly with the fatal results which almost invariably follow that mode of operating in which the external incision exposes not only the whole of the outside of the sac, but sometimes its contents as well. Mr. Coulson, in the course of the last year, operated with Mr. Callaway upon a case in this manner.

Case 7.—Mr. Childs adopted this method of operating most successfully, for a very large strangulated hernia of this class, on a person very corpulent, and in other respects unfavourable for operation. The details of this case are interesting, and are recorded in the Lancet for March, 1848.

Case 8.—In April, I was requested by Mr. Salmon, of White-street, Borough, to see Mrs. D., who was suffering under a large umbilical hernia, which had been strangulated between two and three days. The corpulency of this patient, and general laxity of fibre, rendered the prognosis at least very uncertain. The operation was performed in the manner described, the mass easily reduced, and the patient recovered within ten days.

III. *Ventral.*

Case 9, (*c*).—I was requested by Mr. Wright, of Whitecross-street, to see a patient, in consultation with Dr. Conquest, who had *three* distinct ventral hernia; two through the linea alba, below the umbilicus,—the third through the linea semilunaris, on the left side. One of these hernia was evidently strangulated, and had been so for several days before she sought advice. By the seat of the greatest amount of tenderness, I was led to conclude that the strangulation was effected in that tumour which was situated nearest to the umbilicus. The corpulence of this patient was so excessive that although the several masses were large, they hardly caused any appearance of irregularity in the general surface, and this together with intense irritability of the stomach, a dry and furred tongue, symptoms of general peritonitis, and a bad constitution, afforded no grounds for entertaining the least hope that the relief of the parts would rescue the patient. Still, as every other means had been tried in order to procure reduction, I did not deem myself justified in allowing the ruptured parts to remain longer unrelieved; I therefore returned them, after operating in the same manner as in the cases of umbilical hernia; but although the parts were readily and effectively returned, for a passage through the bowels was thereby attained, the patient sunk on the second day following.

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